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Status of the United States Western Pacific Tuna Purse Seine Fleet and Factors Affecting Its Future

Robert Gillett, Mike A. McCoy, and David G. Itano

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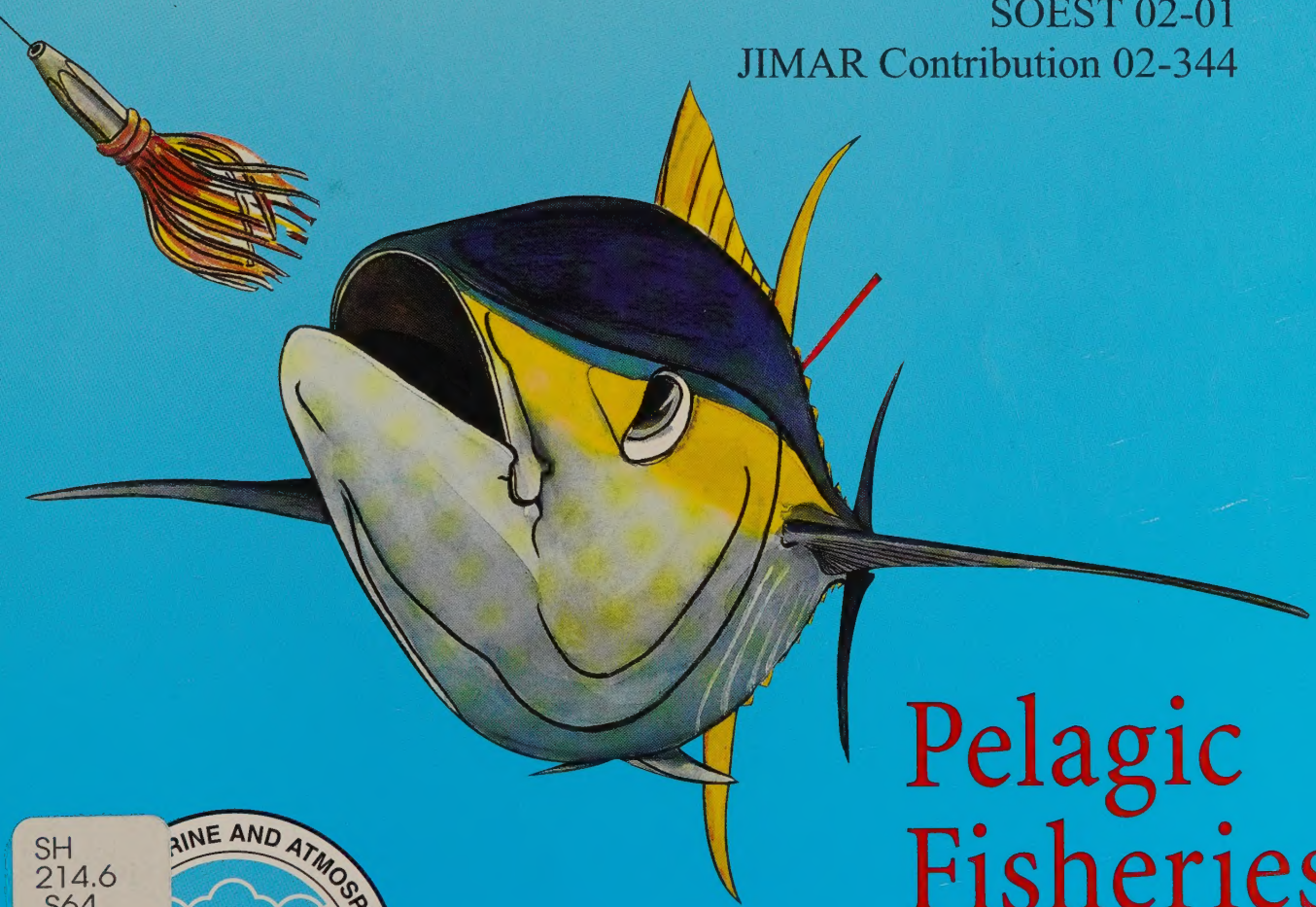

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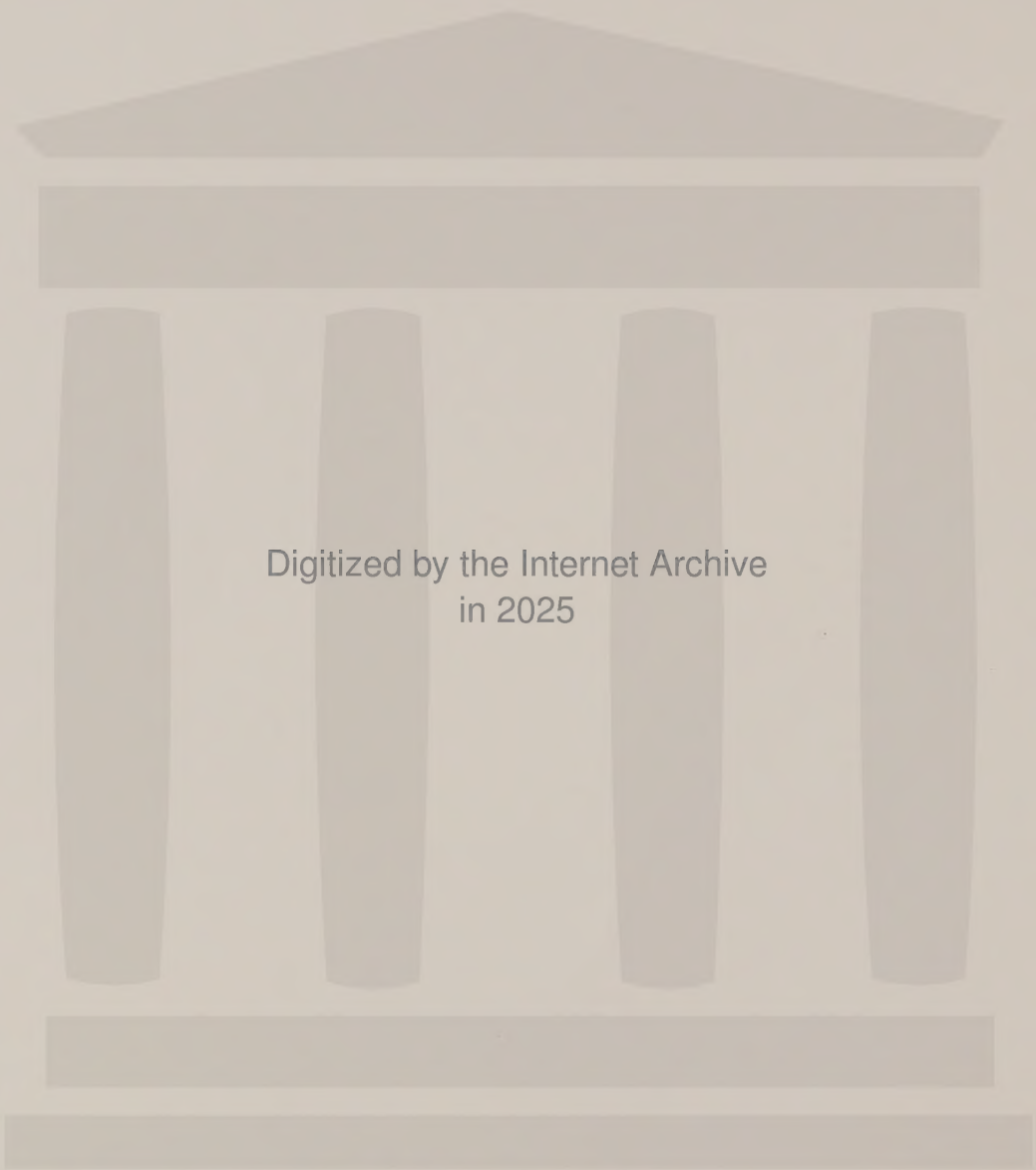
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Robert Gillett
Gillett, Preston and Associates
P.O. Box, 3344
Lami, Fiji

Mike A. McCoy
Gillett, Preston and Associates
73-1091 Ahikawa Street
Kailua-Kona, HI 96740

and

David G. Itano
Joint Institute for Marine and
Atmospheric Research
University of Hawaii at Manoa
1000 Pope Road, MSB 312
Honolulu, HI 96822

LIBRARY
NOAA, NMFS Honolulu Lab.
2570 Dole St.
Honolulu, Hawaii 96822-2396

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ABSTRACT

The study focuses on aspects of the dynamics of the United States tuna purse seine fleet with the intention of increasing the information available for management of western Pacific tuna fisheries. The fleet's history is reviewed, major interest groups are described, and various factors affecting its operation and forces influencing its future are discussed. To carry out the study, the authors used their experience with the U.S. fleet together with interviews of a large number of important stakeholders. Interviewees included present and past U.S. vessel owners/managers, fishing vessel operators, representatives of several tuna processing companies, representatives of the U.S. tuna industry, and tuna fishery managers.

Specific topics addressed are the movement of the fleet from the eastern Pacific to the western Pacific, fishing patterns, specifications of the fleet, stakeholders in the fleet, and major issues confronting the fleet. Positive and negative factors affecting the fleet are analyzed and the most important threats to its survival are identified. Current issues are viewed in light of how the fleet has coped with previous threats in the period from the mid-1950s to the late 1980s.

Information on the future of the U.S. fleet is conceptually divided into three categories: opinions expressed by other studies and individuals; what can be stated with some degree of confidence; and what can be speculated from information in this report and from other sources. The management implications of both a declining fleet and the demise of the fleet are subsequently explored.

The four major factors described as threatening the continued viability of the fleet are (1) low or stagnant prices, (2) the fleet's high costs of production, (3) the reduction of advantages for American Samoa, and (4) the underlying threat of a lack of generational continuity in vessel-owning families.

With respect to the future of the fleet, many of the factors causing the downward trend in U.S. vessel numbers will probably persist. Conversely, a recent change in a trade arrangement with Andean Pact countries will have a favorable impact on the fleet. Most of the events that have had a major effect on the U.S. fleet in the past (both negative and positive) have been largely unexpected.

In the longer term, the composition of the fleet with respect to ownership is likely to

evolve and be made up of more corporate-owned vessels and vessels owned by individuals who have other than strictly financial reasons to stay involved in the industry. This change may be similar to what has occurred in the U.S. agriculture sector, with the evolution from family-owned farms to agro-business ownership.

The management implications of two possible scenarios in changes to the U. S. fleet are described. The entry of additional fleets into the western Pacific and a consequential increase in overall effort in the fishery, degradation of the quality of fisheries data and flag state responsibility, and increases in FAD-related fishing are identified as some of the most likely consequences. There are several indicators, including experience in the eastern Pacific where the U.S. fleet is no longer active, that point strongly to the U.S. Government continuing its engagement in the management of the western Pacific tuna fishery should its purse seine fleet cease to exist.

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1. INTRODUCTION

The western Pacific is the most important tuna fishing area in the world. In recent years almost two million metric tons (t) of albacore, bigeye, skipjack, and yellowfin have been landed annually, more than half of world tuna catch. Effective management of this large resource is critically important and requires a thorough knowledge of the important tuna fisheries of the region. Although a fair amount of tuna catch data from the various fisheries operating in the area is available, information on the dynamics of the various tuna fleets is much more difficult to obtain. For an understanding of these fleets, it is important to be aware their history, interest groups, various factors affecting their operation, and forces influencing their future. This report explores these subjects for one of the important tuna fleets in the western Pacific.

About 80% of the tuna in the western Pacific area are caught by purse seine gear. Interests from Japan, Korea, Taiwan, Philippines and the United States operate the major purse seine fleets. These seiners, numbering about 200 vessels in the region, catch about a million tons of tuna annually. There are currently about 30 U.S. flag purse seine vessels operating in the region. In the 1990s the U.S. vessels landed between 144,000 to 203,000 t, or from 15 to 25 per cent all tuna caught by purse seine gear in the western Pacific. This report examines the dynamics of the U.S. western Pacific purse seine fleet.

Although it would be desirable to similarly study all the important tuna fleets operating in the western Pacific, the immensity of such a task dictates that the work should be approached incrementally on a fleet-by-fleet basis. The U.S. purse seine fleet was chosen for this initial study for several reasons. Information availability is relatively good for the U.S. fleet due to several factors. The fleet is economically important, especially for employment in American Samoa and because of the access fees in most Pacific Island countries. In addition, the regime under which the fleet is managed is considered to be a positive model. Finally, the fleet has recently experienced a substantial decline in numbers and there are some doubts as to its future existence. Although the U.S. fleet was selected for a close examination in this study, it is hoped that this exercise will encourage a similar examination of other important tuna fleets of the western Pacific in the near future.

Several facets of a study of a fishing fleet's dynamics should be noted. A major feature is the commercial secrecy characteristic of the activities and intentions of most fleets, including the U.S. purse seine fleet. Furthermore, this fleet is in some respects a sub-sector of the large U.S. tuna industry, an industry of large complexities and subject to considerable national and global business and political forces. The study had additional difficulties due to the geographic dispersion of the key players. Important stakeholders are located on or near the fishing grounds in the tropical Pacific. The vessels are based in American Samoa but the offices of the vessel owners are in southern California. The headquarters of the various tuna processing companies are in several locations in the United States. Government and inter-governmental fishery management agencies are located in California, Hawaii, and the Pacific Islands. Important policy makers are based in Washington DC. Finally, the short period allocated for the study, slightly more than two person-months, and budgetary constraints restricted its scope. In short, this brief study covered an elusive subject. The results should therefore be considered indicative rather than exhaustive.

To obtain information for the study, travel was undertaken to the World Tuna Trade Conference in Malaysia in late May 2002, and to American Samoa and California in June 2002. At those locations interviews were carried out with important stakeholders in the U.S. fleet.

- Present and past U.S. vessel owners/managers
- Fishing vessel operators
- Representatives of several tuna processing companies
- Representatives of the U.S. tuna industry

- Tuna fishery managers from the U.S. government and from inter-governmental organizations
- Tuna researchers
- Key staff in the government of American Samoa government
- A U.S. congressman

A significant amount of information was also obtained from published and non-published reports, from the Internet and from previous studies by the three authors.

In the interviews a variety of key issues was discussed, including business developments, the relationships between the various interest groups, factors that determine major decisions of U.S. vessel managers, forces shaping the future, and fisheries management implications of major changes. To obtain the varying perspectives and to some extent gain an impression for the more sensitive or controversial subjects, most issues were discussed with several relevant individuals, rather than relying solely on one opinion. Early in the study it was noted that, although most of the people interviewed were quite free with information on general principles, many were hesitant on specific matters, especially on financial or operational topics. In order to maintain a flow of information, these areas were generally avoided. This had an impact on the authors' ability to collect reliable and validated financial data, with the result that such information is notably scarce in this report.

The three authors of this report used their different backgrounds to interpret the information gathered. They all have in excess of 25 years of experience relevant to the U.S. fleet, including working on the vessels, having involvement with commercial fleet management, being scientific observers, and carrying out formal studies of purse seining profitability, gear technology, operating patterns, changes in productivity, and crew arrangements.

A number of terms used in this report require clarification. The name of the geographic area of operation of the U.S. purse seine fleet in the Pacific Islands causes difficulty, as a variety of terms are often used, none of which are specifically meant to describe the area where the fleet fishes. In roughly descending size, terms used include the western and central Pacific Ocean (WCPO; most of the Pacific west of 150°W), the U.S. South Pacific Tuna Treaty area, Secretariat of the Pacific Community statistical area, FAO statistical area 71, The Pacific Islands region, and the extended economic zones (EEZs) of Pacific Island FFA-member countries. The fishery area is also interpreted to mean the zone(s) of concentration of tuna fishing effort, which can be subject to considerable seasonal and annual change. For lack of a better term, in this report "western Pacific" is used and is meant to represent that part of the tropics in the center and west of the Pacific where the U.S. purse seine fleet has historically operated. It therefore excludes that part of the Pacific bordering southeast Asia, and the non-tropical New Zealand waters.

There are also other terms requiring clarification.

- Although it is recognized that the United States has several tuna fleets, the terms "U.S. fleet" and "U.S. tuna fleet" in this report mean the U.S. western Pacific tuna fleet licensed to fish under the U.S. Tuna Treaty, unless otherwise indicated.
- Although it is recognized that U.S. interests own or control the activities of purse seine vessels registered outside the U.S., the term "U.S. purse seiner" is used for U.S. flag vessels.
- "U.S. purse seine vessels" refer to those vessels measuring greater than 400 gross tons.
- In 1988 the Treaty on Fisheries between the Governments of Certain Pacific Islands States and the Government of the United States of America came into force. Unless otherwise indicated, this agreement is referred to as the "Tuna Treaty" or the "Treaty."
- The Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean was opened for signature at Honolulu in September 2000. The Convention established the Western and Central Pacific Fisheries Commission.
- Unless otherwise stated, volumes of fish are expressed in metric tons (t).

Note: Those countries of particular importance to the U.S. purse seine fleet are labeled in a larger format.

Figure 1. The Pacific Islands Region

The study is a component of the Pelagic Fisheries Research Program's project titled "Social and Economic Dynamics in the Western and Central Pacific Tuna Fisheries and Their Implications for Fisheries Management." This project was funded by Cooperative Agreement Number NA67RJ0154 between the National Oceanic and Atmospheric Administration and the Joint Institute for Marine and Atmospheric Research, University of Hawaii. The views expressed herein are those of the authors and do not necessarily reflect the views of NOAA or any of its subdivisions.

2. THE UNITED STATES PURSE SEINE FLEET

2.1 The U.S. Purse Seine Fleet in the Eastern Pacific

A California-based fishery for tuna has operated since about the 1920s. Fishing was primarily an occupation of the various immigrant communities, with the Portuguese, Italian, Slavic, and Japanese having the most involvement with the tuna fleet. The family unit was, and still remains, extremely important in the operation and continuity of the fleet. The vessels, based mainly in the San Diego and San Pedro areas, were bait boats from which tuna were caught individually by the pole-and-line method.

During the history of the California-based fishery, an estimated 292 bait-boats participated (Felando, per.com.), occasionally ranging as far south as Peru. In the late 1950s, low tuna prices due to expanding Japanese tuna catches caused a crisis in the fishery. The fleet survived largely through technical innovations that led to the feasibility of using purse seine gear for capturing tuna. In the subsequent years nearly 100 U.S. bait boats were converted to purse seiners and new tuna purse seiners were constructed. At the height of the California-based fishery in the 1970s, the fleet consisted of 140 vessels larger than 100 gross registered tons.

In the 1960s and 1970s the vessels of the fleet experienced restrictions on their activities. Conservation controls resulting in short fishing seasons in the usual eastern Pacific fishing grounds placed a hardship on the fleet. Implementation of 200-mile extended jurisdictions of

Latin American countries and expansion of fishing fleets in several of those countries further limited the activities of the U.S. tuna vessels. U.S. domestic legislation protecting dolphins came into effect in the early 1970s and became progressively more restrictive. These and other factors motivated the U.S. to look further afield for productive fishing areas. There was initially some fishing success in areas off West Africa, but political unrest there discouraged further involvement. The western Pacific became increasingly attractive.

2.2 The U.S. Purse Seine Fleet in the Western Pacific

The shift in base operations by the U.S. purse seine fleet from southern California and the eastern Pacific to the western Pacific can be roughly separated into four phases, dating back to the post World War II era. The initial adaptation to very different oceanographic environment, infrastructure support availability, and for lack of a better term, "fishing conditions" was accomplished within a relatively short period, but remains a on-going and complex process. The following sub-sections describe adaptations and adjustments the U.S. fleet made in the western Pacific fishery in relation to modes of operation and the adoption of new or different technologies. These sections parallel the entries in the *Appendix: Chronology of Event Relevant to U.S. Purse Seining in the Western Pacific.*

2.2.1 Exploratory Phase (pre-1980)

The war in the Pacific was instrumental in creating an awareness in Americans of the size and fishery potential of the western Pacific region, and for the first time introduced U.S. citizens to previously unheard of places like the Marshall Islands, Micronesia, the Solomon Islands and Palau. More significantly, WW II brought in U.S. tuna vessels as naval support craft and exposed American tuna fishermen and fishery scientists to the possibilities of the surrounding waters (Felando, 1987). The link between tuna and the war was not coincidental; some of these Japanese-controlled islands were already being developed for tuna exploitation by Japanese pole and line fleets.

U.S. expansion into the region was foreshadowed by the establishment of the Van Camp tuna cannery in Pago Pago, American Samoa, during the early 1950s, followed by the StarKist cannery in Pago Pago and a Van Camp pole-and-line base in Palau in the early 1960s. The 1970s began a decade of exploratory purse seine fishing, funded by these same tuna canning interests and government sources. From an operational and technical standpoint, these eastern Pacific rigged vessels were poorly equipped and trained for western Pacific operations, and cruises were generally disappointing. The potential of the region was recognized, but new fishing techniques and modified gear were clearly needed. Meanwhile Japanese exploratory fishing cruises to the area between Micronesia and Papua New Guinea (PNG) were able to demonstrate the viability of a year round fishery utilizing U.S. style purse seiners operating on tuna schools found in association with natural drifting objects (Watanabe, 1983).

The emphasis on "log" fishing was necessary to mitigate difficulties the U.S. boats encountered using eastern Pacific style nets, which were shallow and built of heavy mesh. Those nets were designed to work in areas of shallow thermocline and plankton rich, "greener" waters. For log fishing in the western Pacific, setting takes place shortly before dawn when the fish cannot see the net and therefore do not attempt to dive below it. Of great importance is the fact that the school is stabilized by the presence of the log during the entire setting and pursing operations.

The eastern Pacific style seine nets were unsuitable for use in the western Pacific for schools not associated with logs due to the much deeper thermocline and extremely clear water. For log schools, the nets were sub-optimal as a larger net circumference is required to efficiently surround log schools.

It was in New Zealand that the U.S. vessels found a convenient and relatively easy transition to productive seining in the western Pacific where oceanographic conditions (thermocline depth, sea surface temperatures, and water clarity) mirrored conditions off southern California and Mexico. Following successful surveys by an American purse seiner in 1974 and 1975 (Hinds, 1974; Eggleston, 1976), a seasonal skipjack fishery developed off New Zealand's North Island. An added attraction of the New Zealand fishery was that the most productive fishing concentrated within a nearshore band surrounding the North Island, close to the 200 m isobath (Habib et al., 1981) and also close to sheltered anchorages, coastal towns and scenic bays. U.S. vessels operated in the fishery for several years into the early 1980s, initially shifting operations between New Zealand and the eastern Pacific during the same year (Habib et al., 1980a; 1980b; 1980c). Eventually, many of these vessels remained in the western Pacific, deepening their nets and operating between the New Zealand fishery during December to May and migrating to areas north of Papua New Guinea during the remainder of the year.

Meanwhile, an over capitalized eastern Pacific U.S. purse seine fleet began to feel the pinch of more stringent management controls put into place by the Inter-American Tropical Tuna Commission (I-ATTC) for operations in the eastern Pacific as well as declining relations with central American states over fishing access issues (Doulman and Kearney, 1987). Increasing difficulties arising from environmental concerns over fishing on tuna associated with dolphins added additional appeal to the western Pacific where this is not an issue. News of the Japanese successes in log fishing contributed to the shift west, but an even stronger incentive were persistent stories that some U.S. vessels were making some large catches in the New Guinea and Micronesia areas. Those vessels had found what they considered was a wide-open fishery with little competition. Conditions were such that in 1979-1980 the captains of the first 15 or so boats to arrive in the western Pacific provided fishing information to each other over high frequency radios without resorting to the usual codes they had developed to maintain secrecy in the Eastern Pacific Ocean.

2.2.2 Expansion and Development Phase (1980–1988)

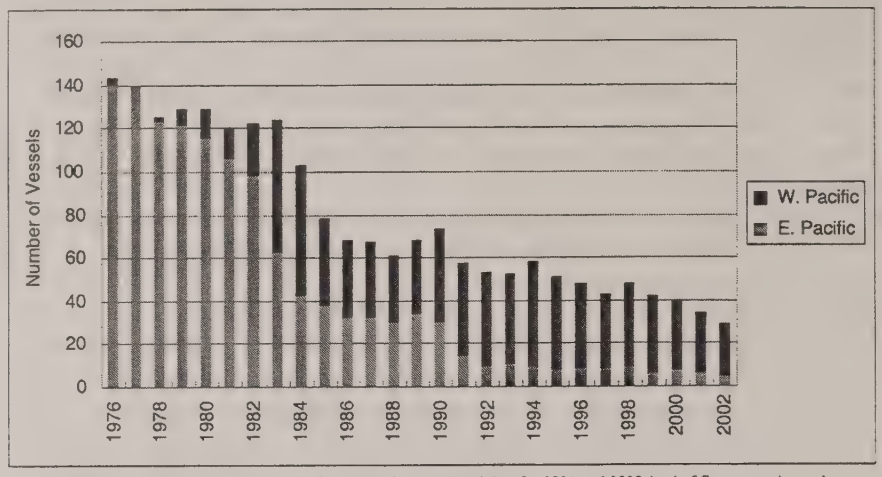
During the early 1980s, U.S. vessels lost interest in the New Zealand skipjack fishery due to declining skipjack prices, particularly for small fish characteristic of this fishery, and exclusion from the more productive nearshore waters. However, by this time, the U.S. presence in the western tropical Pacific was well established, with many vessels shifting home port from San Diego to Pago Pago or the newly established U.S. purse seine base and transshipment ports of Guam and Tinian. The American Tunaboat Association (ATA) negotiated a fishery agreement with Palau, the Federated States of Micronesia (FSM) and the Marshall Islands that began on July 1, 1980, providing U.S. vessels with access to some of the more productive waters in the region (Felando, 1987). During this period, the U.S. tuna policy did not recognize the rights of coastal states over tuna resources. As a result, U.S. tuna vessels continued to operate throughout the western Pacific, encountering some notable conflicts with some island states (Van Dyke and Nicol, 1987; Teiwaki, 1988)

The intense 1982–1983 El Niño pushed many of the remaining U.S. eastern Pacific fleet to the western Pacific, with 62 U.S. flag vessels in the western Pacific by 1983 (Lawson, 2001). During strong El Niño events, the thermocline deepens in the eastern Pacific and waters become characteristically unproductive. A corresponding shallowing of the thermocline in the western Pacific during El Niño events assists purse seine fishing, and may have a positive impact on tropical tuna recruitment (Lehodey, 2000).

Figure 2 shows the size and general geographic location of the U.S. purse seine fleet. It shows that by 1983 as many U.S. seiners were operating in the western Pacific as in the eastern Pacific.

From an operational standpoint, U.S. vessels entered the equatorial fishery by adopting and adapting the general method of setting on tuna associated with floating objects that had been developed by the Japanese. Setting on "log fish" was not new to the U.S. fleet, but this method

required special considerations in the western Pacific region, characterized by a deep upper mixed layer of warm water and extremely clear waters.



Sources: Sakagawa (1991), Lawson (2001), NMFS unpublished data for 2001 and 2002 (end of first quarter); numbers are active vessels larger than 400 gross tons

Figure 2. Numbers of Vessels in the U.S. Purse Seine Fleet

Fishing on tuna schools associated with logs provided some basic advantages to the fishermen due to the tendency of the fish to aggregate close to the log and to rise shallower in the early morning hours (Hampton and Bailey, 1999). The method requires that the set begin between 0300 to 0500 local time to ensure that the net is set and fully pursed just before sunrise. Setting too early can result in excessive meshing of the fish in the net in the pre-dawn darkness, while setting too late usually resulted in poor catches with the school observing and diving below the net before pursing is completed. Omni-directional scanning sonar is necessary for log fishing to assess school size and behavior, with the set timed to occur when the school was as shallow as possible while allowing sufficient time to purse the seine. Detailed technical descriptions of gear and fishing methods employed by western Pacific purse seine vessels are given in Gillett (1986a; 1986b), Farman (1987), Itano (1990, 1991).

Due to the reliance on natural drifting logs, seining operations in the early 1980s were concentrated near large islands or land masses or down current of these areas within the eastward flowing equatorial counter-current (Gillett, 1986a). Logs, flotsam and forage also tends to collect along the interface between the counter current and the north equatorial and south equatorial currents, concentrating log associated purse seine fishing roughly between 10°N to 10°S and 135°E to 170°E.

During the transition years between eastern Pacific and western Pacific operations, U.S. vessels made several changes to their gear and equipment inventories.

- Deepening the nets from 14–16 strips to 21–24[1]
- Altering the nets, removal of porpoise panels, and lightening and enlarging meshes
- Installation of larger power blocks, purse winches, and deck gear to accommodate larger seines
- Using helicopters for searching operations and setting on school fish
- Employing heavy-duty utility boats to tend and tow logs
- Upgrading of electronics for log fishing—scanning sonar, depth sounders, radio direction finders and radio buoys

[1] One strip equals six fathoms or 36 feet.

In later years, these changes became even greater, such as deeper nets, and more powerful winches. However, during the early 1980s, the U.S. fleet was slow to adopt the level and diversity of marine electronics that the Japanese fleet employed. A partial explanation of this may have been related to the fact that the Japanese had larger, deeper and much lighter nets constructed of knotless webbing, compared to the thicker knotted nets on the U.S. vessels. The lighter Japanese nets required greater care in setting and hauling, hence the utility of Doppler current meters, net sounding gear and sophisticated sonar units.

Japanese seiners have been characterized as searching into the water with their electronics and concentrating on log associated schools, while the U.S. fleet used helicopters and greater use of large binoculars to search for school fish and logs. Gillett (1986a) noted a success rate for log fishing on a U.S. western Pacific seiner of 89%, with school fish success rate of 29%; rates considered characteristic of the fishery at the time of the observations (1984). Despite the higher success rate on log sets, the U.S. fleet actively pursued unassociated schools. Data is difficult to access prior to the Tuna Treaty, but Gillett (1986a) notes that in 1984, U.S. log fishing accounted for 60% of total sets and 75% of total catch. Even though success rates on unassociated sets were low, the U.S. fleet actively pursued these schools. There are several possible reasons for this decision.

- Increases value of school fish per ton due to larger average size of fish and possibility of pure yellowfin schools
- Creating opportunity to make very large catches in a short time period
- Enables catches of almost 100% target fish, with no time lost sorting by-catch or undersize tuna
- Uses time waiting for the next morning to log set
- Opportunity to challenge and compete with other vessels

Whatever the reasons, the Japanese and Taiwanese fleets concentrated on log sets during the 1980s, while the incidence of school fish sets rose to 80% of all sets by the U.S. fleet during 1988[2] (Coan et al., 1999). This high rate of unassociated sets by the U.S. fleet probably occurred much earlier, but data coverage for previous years was sparse, covering less than 10 per cent of total U.S. effort (SPC, 1989).

The preferred unassociated schools in the fishery are mostly tuna schools found in association with and actively feeding on baitfish, typically the pelagic anchovy (*Encrasicholina punctifer*), which stabilizes and slows the school speed (Hampton and Bailey, 1999). In order to improve success rates on these schools, U.S. seiners made several changes or improvements to fishing gear and equipment. However, due to the fact that these improvements were phased in over extended periods and not well documented, a comprehensive list is difficult to form. Improvements included the following.

- Continued deepening of nets with corresponding strengthening of hauling gear
- Use of thinner twine and larger mesh to facilitate faster sinking and pursing rates
- Dedicated auxiliary engines to boost hydraulic power to achieve pursing in approximately 15 minutes or less
- Installation of S band "bird" radar to remotely detect bird schools associated with feeding tuna schools
- Substitution of standard radio buoys with selective call radio buoys to reduce setting on a vessel's logs by other vessels
- Increase in refrigeration capacity to handle individual catches usually larger than those for which original vessel was designed

With time, the area of operation of the U.S. fleet expanded eastward in line with improved success rates on unassociated schools. Natural drifting logs are scarce east of the Dateline, but

[2] This was the first year reliable data is available for the U.S. fishery as a condition of the South Pacific Tuna Treaty

feeding schools can be abundant east of the Gilbert Islands during some years and seasons. U.S. vessels transiting between Pago Pago and the log fishing grounds of FSM and PNG undoubtedly fished these unassociated school areas during the 1980s on an opportunistic basis. This may have been particularly significant during the strong 1987-1988 El Niño event, but records for this period are incomplete.

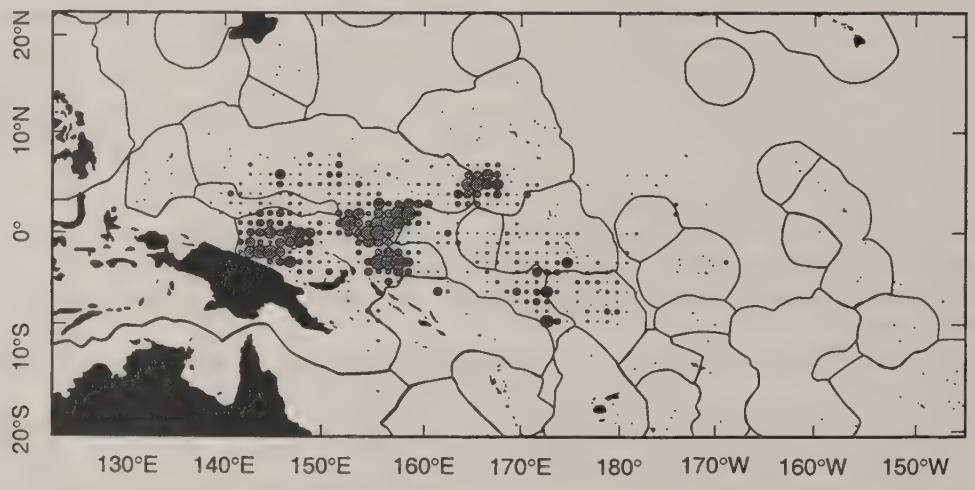
Meanwhile, the Zee Enterprises fleet prospered throughout the 1980s from the Guam base and transshipment port of Tinian in the Commonwealth of the Northern Mariana Islands. This portion of the fleet became well adapted and efficient at school fish seining in the western region of the fishery, concentrating operations west of Nauru.

2.2.3 Early Treaty Phase (1988–1995)

In June 1988, the Treaty on Fisheries between the Governments of Certain Pacific Islands States and the Government of the United States of America (the Tuna Treaty) came into force (Alverson, 1989). This multi-lateral agreement, recently renegotiated for another 10 years, provides U.S. purse seiners with nearly free roaming access to most of the waters of the 16 Pacific Island states that are party to the Treaty. The Tuna Treaty area encompasses the limits of the fishery, from Palau, eastward to the Line Islands of Kiribati and the Cook Islands. This provides the U.S. fleet with a considerable advantage over fleets of other countries that remain geographically limited by domestic policies and/or bilateral access agreements.

Relatively unhindered access to the resource is of great benefit, as the fishing areas frequented by the U.S. fleet in the western Pacific are subject to considerable longitudinal variability. Two patterns of spatial distribution of fishing effort are evident. The first is a longitudinal shift east or west of 160°E longitude in relation to El Niño activity. The second is an eastward displacement in the past few years related to a change in fishing strategy.

Until recent years during non-El Niño periods the U.S. fleet's fishing activities were concentrated in the west of the region in the zones of Papua New Guinea and the Federated States of Micronesia. The distribution of catches in 1995 (Figure 3) is typical of non-El Niño years in the late 1980s and early 1990s.

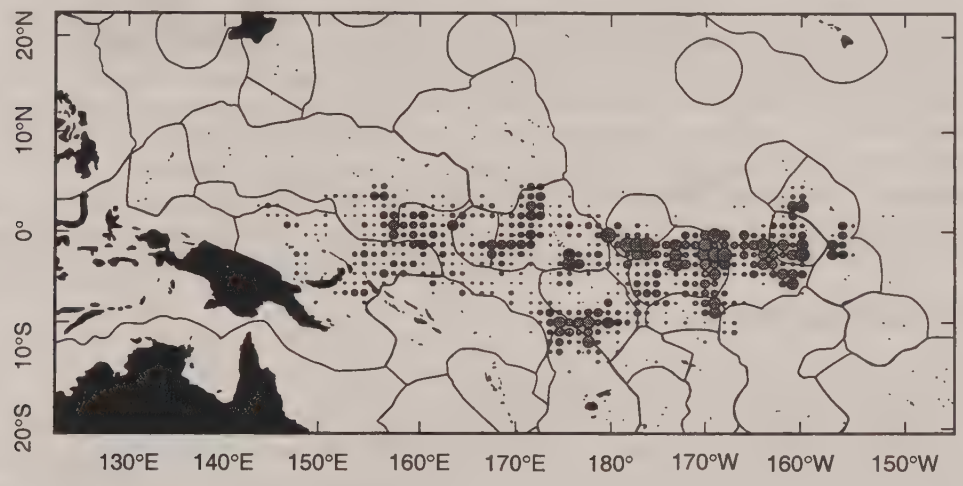


Source: SPC Oceanic Fisheries Programme

Figure 3. U.S. Purse Seine Catches in 1995

During El Niño periods the activity of the U.S. fleet has characteristically shifted to the east, with the zones of Kiribati, Tuvalu and, to a lesser extent, Tokelau producing most of the U.S. catches. The Phoenix Island and Line Island zones of Kiribati, Howland and Baker, Jarvis,

Palmyra, and the adjacent high seas zones that see little activity during La Niña years become notably important for school fish sets. These large eastward shifts in fishing effort and apparent shifts in tuna abundance (or vulnerability) have been linked to large eastward displacements of the western Pacific warm pool noted during significant El Niño events. Lehodey et al. (1997) suggest that areas of high productivity form at the convergence of the eastern edge of the warmpool, and cooler, upwelled waters of the central Pacific. El Niño-related longitudinal shifts of nearly 4,000 km have been experienced in periods as brief as six months. Enhanced productivity in this region during strong El Niño events is proposed to produce high densities of tuna forage, significant spatial shifts of tuna biomass, and subsequently high fishing effort by the purse seine fleet on these baitfish associated schools (Lehodey et al., 1998). The distribution of catches in 1994 (Figure 4) is typical of El Niño years.



Source: SPC Oceanic Fisheries Programme

Figure 4. U.S. Purse Seine Catches in 1994

At the start of the 1990s, U.S. seiners continued their preference for pursuing school fish when available. OFP (2002) shows that in the early 1990s U.S. vessels made about 80% of all sets on free schools, while the seiners of Japan, Korea, and Taiwan made less than half of their sets on such schools. This trend peaked in 1991 when 90% of sets made by the U.S. fleet were on unassociated schools and the fleet achieved its highest catches on record of 216,000 t (Coan et al., 2002). During August 1991, catch rates increased to extremely high levels to average 50.4 t per day during that month, of which 98 per cent was skipjack (SPC, 1992). These catches were apparently driven by an unusually high recruitment of skipjack in the central and western Pacific in 1991, elevating catches by all fleets and driving the total purse seine catch of tropical tunas in the western and central Pacific to exceed one million t (Hampton et al., 2002).

The beginning of this period saw U.S. fishing bases in Pago Pago and Guam as described earlier, with some vessels making deliveries to other locations (i.e. Bangkok, Thailand; Levuka, Fiji; Eden, Australia; the Philippines). However, some U.S. vessels were able to expand their scope of operation and effective fishing effort by transshipping at sea. In 1993, the FFA member countries established a ban on at-sea transshipments, restricting all transshipment to designated ports within the region. In 1995, Zee Enterprises in Guam became insolvent, the Tinian operations closed and 11 U.S. seiners were sold, some to interests outside the fleet (Woodworth and Ebisui, 1999).

Aside from the continual improvements in net design and hauling power, significant improvements to gear technology were made during the 1988 to 1995 period (Itano, 2000).

- Adoption of snap rings and roller snap rings for increased pursing speed, reduced wear and reduced net hauling time (for those vessels not already equipped)
- Adoption of the Spanish style brailing systems or modified Spanish style systems which greatly reduced loading times
- Installation of side net rollers on the working deck to speed drying of the net and work in conjunction with the Spanish style brailing system
- Improvements to refrigeration systems to handle increased brailing speed
- Increased use of remote sensing technologies

The significance of the adoption of Spanish style brailing cannot be over emphasized. This method does not require a net skiff during the drying operation of the net or during brailing. The end result is that fish are loaded much faster and in better condition. Fish quality begins to deteriorate as soon as the school is surrounded by the net, resulting in stress and mortality. Any reduction in time to load the catch results in improved fish quality, which is an important consideration given the more stringent quality standards imposed by the canneries.

In addition, this style of fishing can result in increased fishing power of the vessels. Vessels are able to attempt more sets per day and load the catch faster, which equates to the ability to realize larger individual loads per set before spoilage takes place in the warm water (above 28°C).

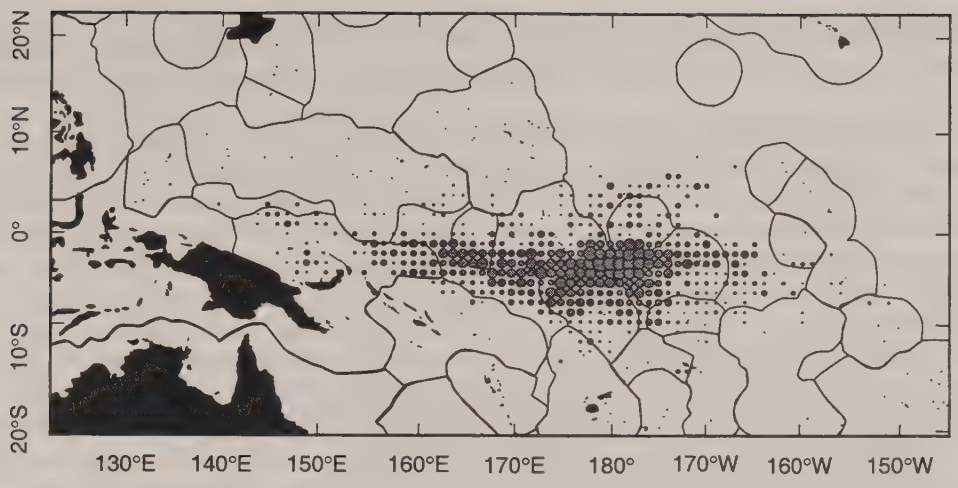
2.2.4 Recent Period (1996–present)

2.2.4.1 High Fish Aggregation Device Use Period (1996–1999)

The 1995-96 season, classified as a weak La Niña period, saw U.S. purse seine effort concentrated west of 160°E in Papua New Guinea and the Federated States of Micronesia with the majority of effort on unassociated sets. In 1996 the fishing strategy of the U.S. fleet began to change—in that year about 56% of the sets were made on drifting fish aggregation devices (FADs) and logs in the Kiribati and Tuvalu zones (Coan et al., 1997). Drifting object sets (FADs and logs) became the main fishing strategy of the U.S. vessels during the next few years, accounting for 56% and 55% (34% log, 21% FAD in 1998) of all sets during 1997 and 1998 respectively (Coan et al., 1999), with fishing effort concentrated in the eastern region of the fishery. Drifting object sets took over the U.S. fishing strategy in 1999 when a remarkable 90% of sets were made on artificial drifting FADs; 6% on natural logs and only 4% on unassociated schools (Coan et al., 2000).

Fishing effort of the U.S. fleet remained in the eastern region during 1999 concentrating in the Gilbert Islands, Phoenix Islands and Tuvalu zones despite the fact that 1999 is considered a non-El Niño year (Lewis and Williams, 2000). On the basis of established fishing patterns, the U.S. fleet would have been expected to fish west of 160°E in the zones of PNG and FSM. It appears, however, that the deployment of drifting FADs has altered this east-west movement pattern, allowing the U.S. fleet to operate closer to Pago Pago. The fleet fished primarily in the eastern area during 1999 in the zones of Kiribati and Tuvalu (Figure 5) despite the non-El Niño character of the year.

Increased use of drifting FADs by the U.S. fleet resulted in a significant reduction of fishing effort in the west. The last year in which substantial fishing took place in the FSM zone by the U.S. fleet was in 1995, with a slight return to the west with reduced FAD use in 2001 (Coan et al., 2002).



Source: SPC Oceanic Fisheries Programme

Figure 5. U.S. Purse Seine Catches in 1999

Some of the implications of increased use of drifting FADs and a general shift in fishing grounds to the east are as follows.

- A major drop in license revenue from the Tuna Treaty for PNG and FSM; a major increase in license revenue for Kiribati and Tuvalu
- U.S. vessels fishing considerably closer to their base in American Samoa, resulting in reduced transit times, the possibility of shorter trips and lower fuel consumption
- Lowered reliance on helicopters; increased use of high tech electronics to monitor drifting FADs
- Decreasing average size of target catch; increased catches of bigeye (a species which is the subject of some management concern); increased by-catch (Coan et al., 1999)
- Increased conflict between vessels over FADs and associated schools

The increase in drifting FAD use in 1999 resulted in a 9% drop in days per trip and record high mean CPUE of 34 short tons (st) per day fished[3] (Coan et al., 2000). Shortened trips produced significant unloading delays in Pago Pago with the smaller sized fish colliding with depressed tuna prices, causing some operators to divert landings to the Philippines, Solomon Islands, FSM and the U.S. mainland.

One technical approach by the U.S. fleet to improve vessel efficiency has been to increase hold capacity by lengthening ("stretching") their vessels. Between 1997 and 2000, nine U.S. vessels increased average capacity from 1172 st to 1619 st.[4] Local tuna abundance and vulnerability can be highly variable in the western Pacific, and vessel operators like the ability to accommodate large loads when fishing conditions become favorable. Larger loads can help mitigate low cannery prices and maximize benefits of lost time for unloading and turnaround between trips.

2.2.4.2 Reduced Effort and FAD Use (2000–present)

Continued depressed cannery prices for small tunas (less than 7.5 pounds, primarily skipjack) into 2000 convinced U.S. operators to tie up their vessels and remain in port rather than operate at a loss. Tie ups occurred in May-June (35% of fleet), October-November (55%) and December

[3] This figure was revised upwards by SPC in 2001.
[4] Two of these vessels were later sold and have left U.S. registry

(87%). The incidence of sets on drifting object sets fell to 67% during 2000 due to an effort by fishermen to avoid small skipjack and target larger fish on unassociated schools (Coan et al., 2001).

Low prices continuing into 2001 resulted in most of the U.S. fleet remaining in port until late February when prices rose slightly and vessels began to leave Pago Pago in search of fish (Coan et al., 2002). Fishing strategy was characterized by a return to unassociated sets (51% of all sets) in an attempt to increase returns by targeting larger fish in unassociated sets. Many of the performance factors, such as number of days at sea per trip, catch per day and catch per set returned to levels representative of the earlier period of low FAD use (Coan and Itano, 2002). Fewer vessels making deliveries (30), the lower efficiency of unassociated school sets, a late start on the season, having to search for fish concentrations after a two-month tie up, and unloading delays all contributed to result in 2001 having the lowest landings by the U.S. fleet since 1988.

The spatial distribution of effort during 2001 was spread over a broad area of the eastern portion of the purse seine fishery. Figure 2 in the report by Coan et al (2002) indicates that the heaviest fishing effort concentrated between the Phoenix Islands, northern Tuvalu, the Gilbert Islands and the Howland and Baker zone.

With fishing effort split evenly between associated and unassociated sets during 2001, fishermen probably conducted both types of sets within this area. Fishing in the eastern area of the fishery appears to fall into two general categories. The first deploys and sets on drifting FADs in the more southerly region (Tokelau, Tuvalu, southern Phoenix and Gilbert Islands). The second involves setting on baitfish associated schools of yellowfin and large skipjack in the Howland/Baker zone, northern Phoenix Islands, Jarvis Island, Palmyra, and adjacent high seas pockets.

From a technical and operational point of view, it appears that U.S. fishermen have been able to incorporate four very important tools in their arsenal to increase fishing power.

- Expertise for catching unassociated school fish
- Expertise for harvesting tuna on purpose-built, drifting FADs
- Ability to quickly load and maintain large catches efficiently
- Ability, to some extent, to control the spatial boundaries of their fishing grounds to improve catch, effort, and economic parameters

2.3 Catch Summary of the U.S. Purse Seine Fleet in the Western Pacific

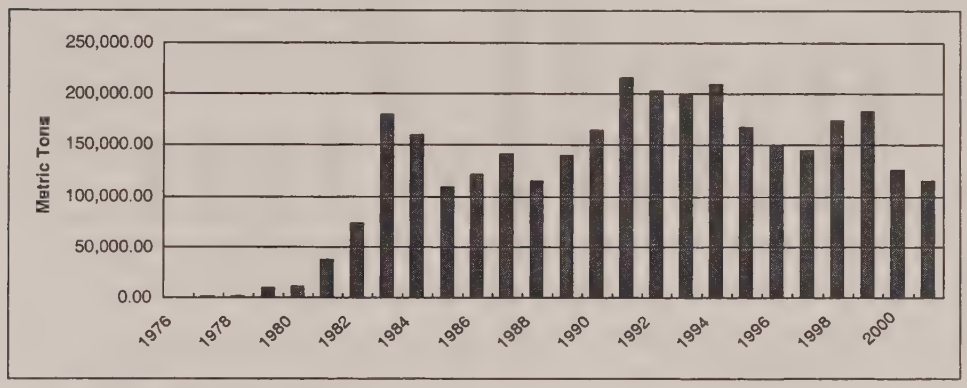
Figure 6 gives the catches of tuna in the western Pacific by the U.S. purse seine fleet from the beginning of the fishery to the latest year for which complete data is available.

2.4 Chronology of Events Affecting the U.S. Purse Seine Fleet

A chronology of events in the evolution of the western Pacific tuna fishery is given in the Appendix. In summary, the major milestones were as follows.

- A vessel owned by Taiyo Fishing company became the first Japanese purse seiner to operate in the western equatorial Pacific in 1963.
- The Japanese government chartered two Japanese purse seiners to fish the equatorial region in 1971 and 1972.
- The U.S. government passed the Marine Mammal Protection Act in 1972.
- The Pacific Tuna Development Foundation was formed in 1974 to encourage the development of tuna resources in the Pacific Islands. PTDF exploratory purse seine cruises were carried out to the central and western Pacific in the late 1970s and early 1980s.
- A U.S. purse seiner began to operate in the Western Pacific fully independent of any charter or sponsorship in 1979.

- The number of U.S. purse seiners fishing in the western Pacific reached its maximum, 62 vessels, in 1983.
- The Tuna Treaty came into force in 1988.
- The price of skipjack dipped below U.S.$400 per ton for the first time since the U.S. fleet moved to the western Pacific in 1999.
- The number of U.S. vessels fishing under the Treaty dipped below 30 in June 2002.



Source: Lawson 2001, Coan et al. 2002

Figure 6. Catches by the U.S. Purse Seine Fleet in the Western Pacific 1976-2001

2.5 Inventory of the U.S. Purse Seine Fleet in the Western Pacific

The term "super seiner" has been used in the tuna industry to define tuna purse seine vessels that carry over 400 short tons in refrigerated holds (Burney, 1997). It is estimated that on the basis of that definition, approximately 440 or so vessels make up the worldwide fleet.[5]

As of July 2002 the U.S. flag "super seiner" purse seine fleet consisted of 27 vessels. It is believed that two of those vessels are currently based in the eastern Pacific. The exact number of vessels that will engage in the western Pacific fishery, however, may be slightly more or less than 25. In addition to the possibility of either or both of the vessels from the Eastern Pacific shifting west, there is at least one newly-purchased vessel owned by a U.S. operator whose flagging intentions are not fully known, and at least one other vessel advertised for sale. For the purposes of the following discussion, however, it is assumed that there are 25 U.S. flag purse seiners active in the western Pacific fishery at the present time.

The license year in the U.S. tuna treaty runs from 15 June of one year to 14 June of the following year. On the basis of those dates, the number of vessels issued licenses per licensing year since the commencement of the Treaty in 1988 are shown below in Figure 7.

It is believed that nine U.S. flag purse seiners left the fleet during the past two years. Four of the vessels were sold to New Zealand companies, and one each was sold to China, Ecuador, Mexico, Venezuela, and Panama. Five of the vessels were owned by individual owners, two by the corporate owner[6] TriMarine, and two by an investment firm.

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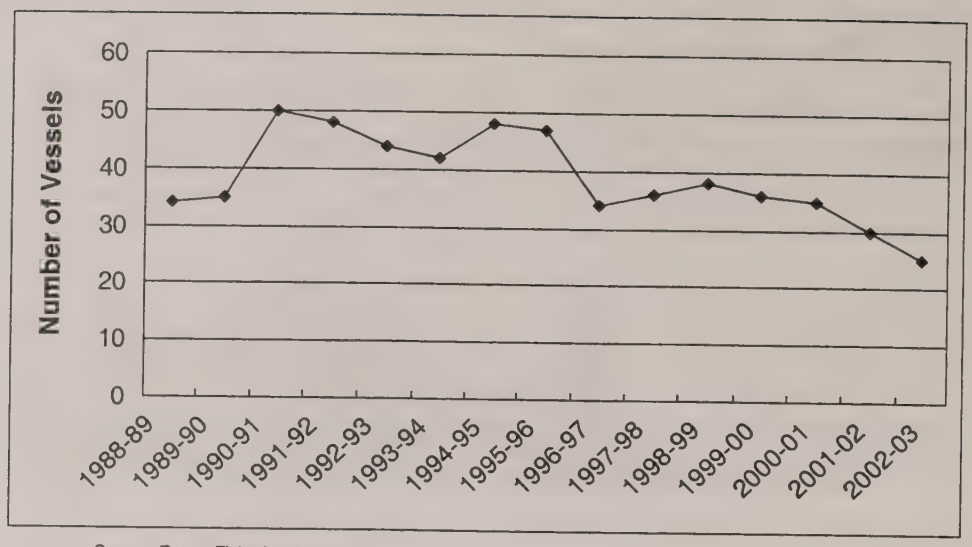
[5] Estimates on the total number of tuna purse seiners worldwide can vary considerably. Numbers released at an international tuna conference in Vigo, Spain in 2001 indicated there were 439 such vessels in that year. The WTPO (Moron, 2002 estimates there could be 540-550 vessels. The differences may be due to definition and exactly what capacities are referred to, or what is counted as a purse seiner, i.e. including perhaps support vessels in group seining operations.

[6] Although most "individual" boats are owned by corporations, the term "corporate owner" as used here is meant to mean ownership by a large company, in this case TriMarine, that is engaged in aspects of the tuna industry other than vessel ownership.



Source: Forum Fisheries Agency

Figure 7. Number of Vessels Licensed Under U.S. Tuna Treaty, 1988 to Present

2.5.1 Ownership

The 25 vessels are owned by a total of 14 entities. One corporate owner owns six vessels, or about 25 percent of the total, and an investment company owns one. The remaining 18 are owned by a total of 12 individual owners. Two of the individual owners own three vessels each, and two individual owners own two each. The remaining eight vessels are owned singly by eight individual owners.

By comparison, in 1997 when there were 34 U.S. vessels active in the western Pacific fishery, there were 15 ownership entities, and the one corporate owner (different from the current one) accounted for 20% of ownership of the fleet.

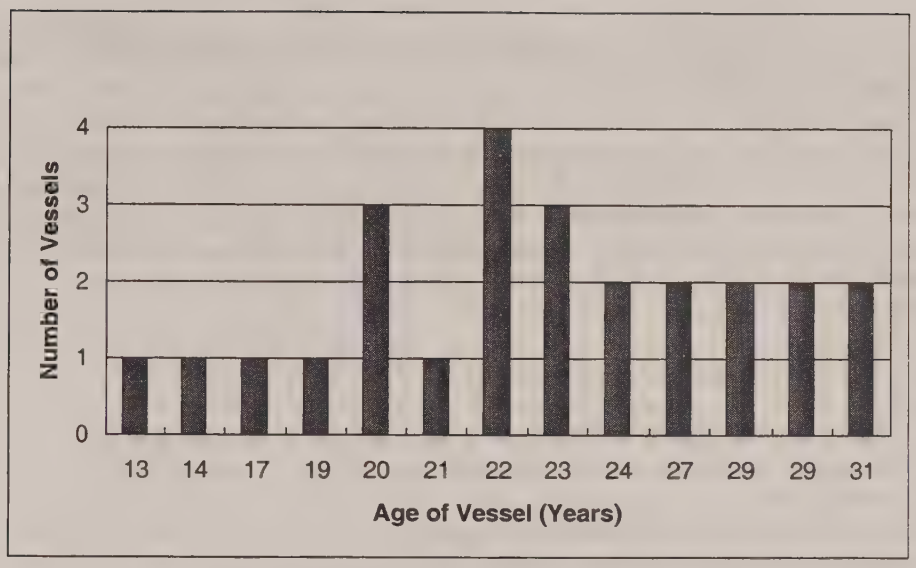
2.5.2 Age of the Fleet

The average vessel age of the U.S. western Pacific fleet is about 23 years. A total of 13 vessels, or 52 percent were built in the 1970s, and 12 vessels or 48% were built in the 1980s. The oldest vessels in the fleet are 31 years old, and the last new vessel to enter the fleet was in 1990. The distribution of vessel age in the fleet is shown in Figure 8.

2.5.3 Physical Characteristics

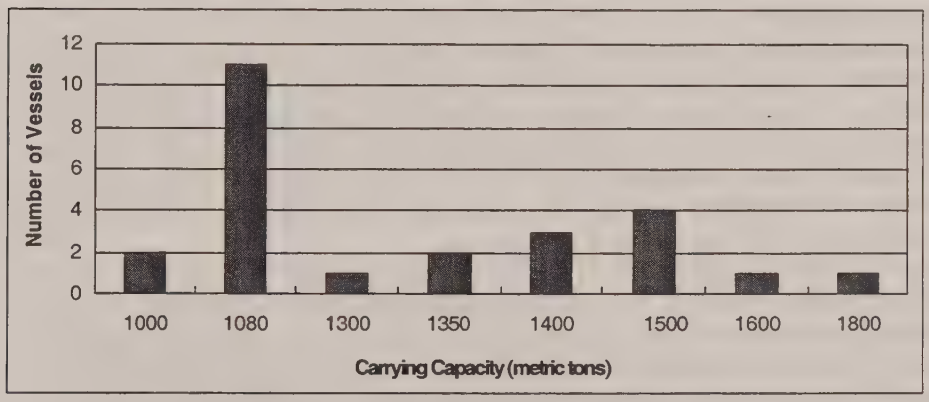
Tuna purse seine vessels are some of the most complex fishing vessels afloat in terms of technology and machinery. The hydraulic systems on large super seiners require more than a mile of piping, and are equipped with at least four auxiliary engines in addition to the main propulsion engine. The cost of building a new seiner today probably exceeds U.S.$15 to $18 million, depending upon the country where it might be built, and a new net can represent an investment of $400,000 to $600,000.

Of the 25 vessels currently licensed, 23 were built in the U.S., and two are of European origin. Fish carrying capacity is an estimate of tonnage that can vary with the size and species of fish loaded onto the vessel. It is estimated that the total fleet carrying capacity is about 31,600 t, with an average capacity of 1,264 t. Figure 9 shows the breakdown of carrying capacity in the fleet.



Source: U.S. Coast Guard and Forum Fisheries Agency

Figure 8. Age Distribution of the Vessels in the U.S. Tuna Purse Seine Fleet



Source: Forum Fisheries Agency

Figure 9. Carrying Capacity of the U.S. Fleet

The trend in recent years has been to increase capacity of existing vessels, and ten of the vessels have had their fish hold capacities increased by stretching (cutting the ship beam wise aft of the deck house and adding additional wells). Most of the vessels that have been stretched are those with engines closer to the stern, a design that facilitates such a procedure. Many of the vessels that have not been stretched have their engines further forward, complicating somewhat and increasing the cost of adding fish hold capacity.

The degree to which helicopters are used in the fleet at the present time is not known, but it is believed there has been a significant reduction in their use since late in the last decade when the switch to fishing on drifting FADs became the predominant technique.

3. MAJOR INTEREST GROUPS IN THE U.S. WESTERN PACIFIC PURSE SEINE FISHERY

For the purposes of this report, the identified major interest groups in the U.S. purse seine tuna fishery in the western Pacific are those that in some way can affect or influence activities in the fishery. These groups can be divided into two sectors. The first sector consists of those whose activities make up major portions of the supply chain[7] and are engaged in the fishery's commercial aspects.

- Vessel owners
- Tuna processors
- Other important supply chain participants

The second sector is comprised of those governments in the region that have a direct and vested interest in the continued existence of the fleet.

- U.S. government
- Government of the Territory of American Samoa
- Countries in whose EEZs the fleet operates

3.1 The Commercial Sector

3.1.1 Vessel Owners

About three-quarters of the fleet is still owned by people who belong to "fishing families" from Southern California that have been involved in tuna fisheries for at least two generations. These owners are generally directly involved in the management and operation of the vessel, and generate personal income in the form of vessel management fees, irrespective of the profitability of their vessel. In such organizations with strong family participation, employment can also be generated for close relatives who may serve as captain or senior crew. Office staff can also include one or more family members or their spouses.

TriMarine, a firm that has become the world's highest volume trader in frozen tuna, owns the remaining one-quarter of the fleet. Traders have evolved to where they are usually full participants in the market, buying and selling on their own account rather than acting as brokers that charge a fee for selling someone else's fish. The firm already owned several non-U.S. flag tuna vessels when it purchased the former StarKist fleet in mid-2001, bringing its total fleet size at the time to twelve vessels.

The financial details of vessel ownership in the U.S. fleet are not fully known, however it is believed that most vessels owned by members of families with a long history in the fishery are not heavily mortgaged. TriMarine's purchase of the StarKist fleet in 2001 (and perhaps other vessels) was reportedly financed by the proceeds from the sale of their share of the Chicken of the Sea cannery in American Samoa. The firm has continued its vessel purchasing and selling activity during 2002. It recently purchased a large seiner from the French company Saupiquet and a U.S.-built seiner from a Korean company that ceased fishing operations. It has most recently reportedly sold two of its smaller and older former U.S. flag seiners to Venezuela and Panama.

[7] As used here, the supply chain refers to the network of entities that perform the functions of raw material procurement, transformation of raw material into intermediate and finished products, and the distribution of these finished products to customers. Since U.S. vessels primarily deliver directly to canneries, the transportation sector as it applies to transshipment of raw material is not included.

3.1.2 Tuna Processors

Over the last two decades there has been considerable consolidation in the tuna-processing sector. Since 1979, 11 tuna canneries operating in the U.S. and its territories have closed, leaving just four remaining today—StarKist and Chicken of the Sea in American Samoa, and Bumble Bee in California and Puerto Rico. Current employment at these four facilities is around 6,000 (Corey and Babula, 2002).

The canned tuna business in the U.S. is dominated by three brands that continue to lead the market. StarKist has about 40% of the canned tuna market, Bumble Bee 24% and Chicken of the Sea 19%. Other brands and private labels account for only 17% of the U.S. market (Lischewski, 2002). While all serve the same basic market in the U.S., the three processors are not identical in their relationships to the U.S. purse seine fleet.

Most of the tuna caught by the U.S. purse seine fleet in the western Pacific is processed by the two canners in American Samoa, StarKist and Chicken of the Sea, and subsequently sold in the U.S.. It is estimated that in 2001 approximately 200,000 t of tuna was processed at the two canneries in American Samoa, of which approximately 120,000 tons or 60% originated from the U.S. purse seine fleet in the western Pacific.[8] It is estimated that production of the American Samoa canneries currently supply about 50% of the U.S. market for canned tuna.[9]

HJ Heinz, the corporate parent of StarKist, has recently announced it is divesting itself of StarKist Seafoods along with several of its U.S.-based divisions, including pet food and baby food in a stock transfer transaction with Del Monte Foods. Heinz is an international food company with reported sales of over $9 billion and a work force of about 48,000 prior to this latest corporate divestiture of StarKist. Heinz will apparently retain 70% ownership of the new company formed with Del Monte that will include the American Samoa cannery. These arrangements will evidently not include Heinz tuna operations and activities elsewhere in the world, such as manufacturing arrangements and tuna brands like Greenseas in Australia, John West in the UK, and Watties in New Zealand. Overseas Heinz units will also continue arrangements to utilize tuna processing facilities in Africa and Latin America, providing favorable entry into the European Union (EU) where it has a large market presence through well known brands.

Chicken of the Sea in American Samoa is now 100% owned by the Bangkok-based Thai Union group after their buyout of former partners TriMarine and Ed Gann in 2000. Thai Union is the second largest tuna processor in the world (after StarKist), with several canneries in Thailand as well as the American Samoa facility. In addition to canned tuna, Thai Union owns a can manufacturing plant in Thailand and factories that process shrimp and produce surimi and fish meal as well as other products. Roughly half of the company's sales came from canned tuna exports in 2000.

Bumble Bee Seafoods Inc. is a U.S. corporation headquartered in San Diego, with revenues of approximately $750 million and employment of approximately 5,000. In 2000 Bumble Bee Seafoods was acquired by ConAgra Foods, a U.S. corporation headquartered in Omaha, Nebraska, with annual revenues of approximately $27 billion and employment of approximately 80,000. ConAgra is the second largest retail food company in the U.S. and the largest food service provider. Bumble Bee owns tuna canneries in Puerto Rico, California, and Ecuador, and is an active buyer in the international market buying whole frozen tuna and loins. It has processing arrangements in Fiji with the government-owned PAFCO cannery and in Trinidad that produce mainly albacore loins. The PAFCO arrangement was recently solidified by a seven year

[8] The remainder came from mostly foreign deliveries of albacore, direct offloading of skipjack and yellowfin by some foreign purse seiners, probably some transshipped fish from elsewhere, and at least 5,000 tonnes or more of imported frozen cooked loins.

[9] This includes albacore which were not caught by purse seine vessels.

agreement that included upgrading and expanding the facility's throughput to 30,000 t annually, up from 23,000 t.

The company's brand has been traditionally strong in the canned albacore market, and owns the top canned seafood brand in Canada. The company's non-tuna business includes the processing of shrimp and surimi. Bumble Bee is also the largest buyer of canned salmon in the world and the largest customer of U.S.-owned processing facilities in Alaska (Lischewski, 2001).

3.1.3 Other Supply Chain Participants

Tuna traders are most active among fleets that do not deliver directly to tuna processing facilities.[10] Although the vast majority of the catch of U.S. seiners is offloaded directly in American Samoa, traders and brokers do occasionally get involved in the sale of transshipped fish from the U.S. fleet. As major participants in other aspects of the industry they have a vested interest in the activities of the U.S. purse seine fleet in the western Pacific.

TriMarine is the world's largest frozen tuna trader, in addition to owning a significant portion of the U.S.-flag purse seine fleet. The company buys and sells tuna on its own account in the western Pacific and worldwide, supplying raw material to processors in Asia, Europe and elsewhere.[11] In addition to tuna trading activities and vessel ownership, the company acts as agent for longline vessels fishing in the Indian Ocean and owns a factory in Singapore for processing and packaging of tuna longline bycatch. It is also affiliated with loining plants in Ecuador, Colombia and Kenya. These plants access markets in the EU under favorable tariff arrangements granted those countries by the EU.

It is also important to recognize the role of the retail and food service sectors in the marketing of canned tuna. Food retailers and food brokers exert an enormous force in the marketplace for the product of U.S. purse seine efforts. Consolidation among grocery chains in the U.S. is such that in 1999 the top 10 controlled 50% of the grocery market business and were projected to control 70% by 2005. Food brokers are also consolidating, with the 30 largest companies combining into only four during the last decade. These sectors have reportedly become so powerful that they can use access to retail shelf space as a means of squeezing suppliers for lower prices and greater performance (Krampe, 2000).

3.1.4 Relationships Within the Commercial Sector

The U.S. corporation HJ Heinz restructured its StarKist division during 2001 by among other actions closing its Puerto Rico tuna cannery and selling its fleet of eight purse seiners. The seiners are now owned by TriMarine, which retained the supply contracts to the StarKist Samoa cannery.[12] With StarKist's sale of its vessels and the sale of TriMarine's and Edmund Gann's shares in the Chicken of the Sea cannery, the industry has dismantled much of its previously vertically integrated structure.

The supply contract situation highlights the importance of the relationships between producer and buyer, in this case purse seiners and canners. Although the prices paid for tuna can be volatile in the short run, the need to ensure that there is a buyer in times of glut tempers producers from switching buyers too often, if at all. Although canners have a strong need for the guaranteed supply of raw material represented by the U.S. fleet's fishing activities, the system today strongly favors the buyers. This is because in the global tuna industry, and particularly in the western Pacific where harvesting capacity is large, the options for supply exist in addition to the U.S. fleet, while that fleet has few options for sale to other markets.[13]

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[10] The major fleets that rely mainly on transshipment are the Taiwanese and Koreans.

[11] Other major tuna traders that are active in the western Pacific include the Japanese firm Itochu and the Taiwanese company FCF.

[12] It is believed that this sale represented the last divestiture of direct cannery ownership in purse seiners (Corey, pers. comm.).

[13] The reference here is for sale directly to canneries where no transshipment costs are incurred.

It was not always this way, as during the fleet expansion period of the 1960s and 1970s the canners required increasing amounts of raw material and as a result, owned outright or had financial controlling interest in a large number of purse seiners (Iversen, 1987). The need for raw material supplies also led the canners to contract with vessels and provide credit for supplies and fuel in return for agreement to sell the catches to the cannery at a pre-established price. As competition throughout the industry has increased, this sharing of economic risk by both parties has tended to place a greater portion of the risk on the fleet. Indications are that at least from the perspective of some vessel owners, the previous symbiotic relationship between producer and buyer is no longer the same.[14]

The situation is not totally hopeless for the fleet, however. By virtue of its basing in American Samoa, it represents a guaranteed source of supply to the canners there. While the canners do have other supply options, the complicated nature of the relationships among competitors in the western Pacific fishery means that, at least for the time being, those supply options are not as guaranteed as a fleet based in American Samoa. The regular source of supply from the U.S. fleet allows the canneries to schedule production and minimize the amount of time fish is held in cold storage at the cannery. In order to retain these benefits, the canners find it necessary to include enough financial incentives to retain the loyalty of vessels to a particular cannery.

The relationships between the commercial participants are changing in other ways as well. Today, both canners and the fleet are increasingly affected by globalization in the tuna industry.[15] While globalization is not a new phenomenon, in recent years the pace has increased with the advent of new technologies and consolidation within the processing sector in particular. An example of globalization in the tuna industry can be found in the overseas activities of the U.S. company HJ Heinz, which until recently owned StarKist. Through Heinz Seafood Europe, the company is a shareholder in the French company Cobrecaf, which operates 16 tuna purse seiners and four carriers in the Atlantic and Indian Oceans. The other shareholders are a large conglomerate based in Morocco, an Italian tuna canner, and an American company engaged in the fish transportation business.

The global character of the tuna business enables industries to adjust to supply deficiencies and re-direct raw material to locations where they might benefit from better prices or even a market at all in times of glut in usual markets. In the past the major commodity traded was only in frozen fish, which moves relatively unhindered by trade barriers, because most countries do not want to deprive their domestic manufacturing industries of raw material. More recently, the trade in pre-cooked loins has increased, and this has become a globally-traded commodity as well.

The increasingly global nature of the trade in raw material for canning does not appear to overtly benefit the tuna fleets. Prices tend to be linked worldwide and are determined by supply and demand. Even when prices may rise quickly in one location, vessel owners that are assured a market for their catch through long-term relationships with processors are not in a position to take advantage of such short-term opportunities elsewhere.

Operationally, the impact of these global activities and the tariff and trade barriers that exist can be felt by some segments of the U.S. fleet in the western Pacific. For example, Italy has traditionally been an importer of yellowfin as that is the major species canned there. In the past, the Italian requirements of about 100,000 tons per year were met from various sources in the Atlantic, Pacific, and Indian Oceans. During certain months in the western Pacific when high percentages of yellowfin in the catch was expected, brokers purchased frozen fish at transshipment points in the region for shipment to Italy. In recent years increasing labor costs in

[14] While owners are unwilling to discuss the financial terms of contractual arrangements, they cite other issues such as the loss of priority offloading as an indication of the deterioration of benefits from supply contracts.

[15] As used here, the term "globalization" refers to the increased mobility of goods, services, labor, technology and capital throughout the world.

Italy have forced the canners to rely exclusively on imported loins. EU tariffs for importation of this commodity restricted the sources and led to the establishment of loining plants in certain countries bordering the Indian Ocean that eliminated what had been a good market for yellowfin from some vessels in the western Pacific.[16]

3.2 The Government Sector

Whereas business strategies are intended to design and guide activities within the supply chain, government strategies in free market economies are generally regulatory in nature and (other than some examples of resource management) are reactive to the activities of the commercial sector. Although reactive, government interventions can nevertheless guide and have a very strong influence on commercial activity, as in the imposition or removal of tariffs or non-tariff barriers.

3.2.1 U.S. Government

The U.S. government has greatly facilitated the existence of the canneries in American Samoa (and by extension, the fleets that serve those canneries) through domestic legislation. This provides Federal tax concessions and exempts American Samoa cannery production from domestic U.S. tariffs, national minimum wage standards, and the Nicholson Act prohibiting foreign vessels from landing fish in U.S. ports.

The exemption from domestic tariffs has resulted in the investment in U.S. canneries in American Samoa as opposed to neighboring countries where wage rates are considerably lower. The American Samoa cannery wage rates, currently $3.75 per hour, while high by Pacific Island standards, are still low compared to the two other U.S. cannery venues, California ($11) and Puerto Rico ($6.50). The ability to receive fish from non-U.S. vessels has traditionally enabled the canneries to diversify and process albacore from those sources.

The U.S. government became directly involved in the fishery access activities of the U.S. fleet in the western Pacific during the mid-1980s. Prior to that period it was general U.S. government policy to allow the tuna industry, and in particular the ATA, to arrange for fishery access with groups of countries in the western Pacific and to handle the administrative and financial matters associated with such access. It was necessary for the ATA to conclude agreements with groups of countries to ensure greater areas of access but also to remain consistent with then U.S. policy that individual countries could not manage highly migratory fish species.

Several factors and events contributed to a greater involvement of the U.S. government in tuna fishery management matters in the western Pacific during the mid-1980s. The U.S. fleet active in the region grew from 24 vessels in 1982 to 62 by 1983. With that large increase in vessel activity also came an increase in violations of the domestic fishery laws of several PICs.[17]

In addition to the adverse affect these violations caused on relations between the U.S. and countries such as Papua New Guinea, Kiribati, and Solomon Islands, strategic considerations intervened with the licensing of Soviet purse seiners by Kiribati in 1985. A television documentary produced by the Australian Broadcasting Corporation in 1985 highlighted some of these violations and portrayed the U.S. industry in an extremely poor light. This further galvanized the Australian and New Zealand governments to encourage the U.S. government to have direct involvement in the fishery access process.

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[16] In an example of adjustment to changing conditions, one of the traders that formerly dealt in frozen yellowfin from the WCPO for Europe was instrumental in opening a loining plant in East Africa that now supplies yellowfin loins to the EU.

[17] Not all vessels participated in the ATA-sponsored fishery access agreements, while others may have obtained licenses for one area but fished in the EEZs of other countries not party to the licensing arrangement. See Van Dyke and Nicol (1987) for a detailed discussion of these events and U.S. policy shifts during the period.

Although the U.S. did not amend its laws to include national jurisdiction over tuna as a highly migratory species until 1990, it went ahead with negotiation of a treaty with the countries of the South Pacific Forum Fisheries Agency that was concluded in 1987. The "Tuna Treaty" (formally the Treaty on Fisheries Between the Governments of Certain Pacific Island States and the Government of the United States of America) provided guaranteed access for U.S. tuna purse seiners, and allowed the U.S. to exert significant management control over the U.S. tuna purse seine fleet in the western Pacific for the first time.

The Treaty provides the U.S. government access to catch data from the industry for management purposes, including that from the high seas. It also has resulted in an improvement in relations between the U.S. and the PIC governments concerned.

From one U.S. perspective, the fees paid under the Treaty include funds that might otherwise be used as foreign aide in the region. In this interpretation, the Treaty enables the U.S. government to distribute such funds with relatively small administrative costs.[18]

Under certain provisions of the U.S. Internal Revenue Service tax code known as the "possessions tax credit," the U.S. government also provides a Federal tax credit equal to the Federal tax on certain income earned in American Samoa by the processors, and provides a deduction for dividends received.

3.2.2 American Samoa Government

As host to two canneries and the U.S. purse seine fleet, the government of American Samoa is intimately involved in the western Pacific tuna industry. By at least one estimate, American Samoa's economy is more than 80% dependent, either directly or indirectly, on the U.S. tuna fishing and processing industries.[19] The canneries reportedly employ about 4,700 people, and have the combined capability to process about 2,000 tons of tuna per day.

In addition to the Federal government's wage, tax, and regulatory exemptions[20] American Samoa provides a favorable business climate for the canneries by granting local tax exemptions. Such exemptions are granted to the canneries for multiple year periods to encourage investment and expansion. In return, not only does American Samoa enjoy the presence of very large corporate employers, but the canneries also provide economies of scale for such things as reasonably priced public utilities, regular overseas shipping and air travel, and fuel depot operation that would not be possible without such an industry.

3.2.3 Pacific Island Countries

The Pacific Island countries (PICs) are defined here as those belonging to the South Pacific Forum Fisheries Agency (FFA). Comprised of the 14 island countries plus Australia and New Zealand, the FFA countries are all signatories to and benefit from the Tuna Treaty, although monetary benefits to the PICs are in varying degrees.[21] Those PICs with little or no U.S. fishing in their zones still benefit from a distribution of a certain portion of the fees, and in fact for nearly half of them the Tuna Treaty provides most of the access fees received (Gillett and Lightfoot, 2002).

While the direct monetary benefits from access granted to the U.S. fleet tend to be centered in just a few of the FFA countries, there are other less tangible but nonetheless important benefits to

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[18] In fact, the USAID office at the U.S. Embassy in Suva that served the PICs scaled back its activities in the early 1990s and phased out positions that dealt exclusively with fisheries aid issues.

[19] Congressman Faleomavaega is one who has made statements to this effect on several occasions including in press releases, and at the Infofish Tuna Conference in May 2002.

[20] In discussing the two canneries in American Samoa, Corey and Babula (2002) state "they both owe their continued success in American Samoa mainly to Federal and Samoan tax and tariff advantages and a lower wage than on the mainland United States and Puerto Rico."

[21] Those PICs that reap the greatest direct monetary benefits from the treaty are those with the most catch by U.S. seiners from their EEZs. In recent years this has been Kiribati, Tuvalu and to a lesser extent, Papua New Guinea.

all member countries. Negotiations and the implementation of licensing arrangements for the U.S. purse seine fleet provide an opportunity for the PICs to enhance regional cooperation on fishery issues. The implementation of the Treaty and the involvement of the U.S. government have resulted in enhanced compliance relative to some other purse seine fleets active in the region. This in turn has enabled the PICs to establish a benchmark on issues such as the use of the vessel monitoring system (VMS) that can be used with other fleets.

The future of the U.S. fleet and canneries in American Samoa is particularly crucial for neighboring Samoa. According to documentation from the American Samoa Government (ASG, 1999) and discussions with officials of the two canneries, people from independent Samoa represent about 75 percent of the total cannery workforce.

The employment of this labor from neighboring Samoa is believed to result in considerable remittances back to Samoa from salaries earned in the territory, although no figures are currently available. American Samoa canneries also represent the major market for albacore caught by the Samoan small boat fleet. In 2000 Samoa exported around 3,300 tons of longline-caught albacore to the canneries (Watt et al., 2001). Some employment on U.S. seiners also benefits Samoans directly. Although current exact numbers are not known, it is believed that perhaps 50 or more of the fishermen from the PICs employed on U.S. purse seiners are from Samoa.

3.2.4 Relationships Within the Government Sector

With the conclusion of substantial negotiations to renew the Tuna Treaty this year, the major relationships among the government sector, i.e. between the U.S. government and the governments of the PICs, revolves around activities related to administration of the Tuna Treaty.

During the negotiations, the U.S. introduced the concept of limiting fishing capacity into the dialog with the PICs, and the latest amendments to the Treaty include a new article noting "The parties shall, where appropriate, consider the issue of capacity in the Treaty Area." This topic has the potential to provide some dialog outside of the Treaty relationship, however current indications based on the actions of some PICs in continuing to license new entrants does not auger well for any substantial progress in this area in the near future.

3.3 Relationship Between the Commercial and Government Sectors

Prior to 1980 the U.S. had encouraged the tuna industry by providing funding under the Saltonstall-Kennedy Fishery Development Grants program to explore new fishing grounds in the western Pacific. There were also available tax credit provisions to stimulate new vessel construction that remained in the IRS code until 1986. In the early 1980s the U.S. government assisted in financing fleet expansion in several fisheries through the Fisheries Obligation Guarantee (FOG) program. This program guaranteed commercial loans and assisted not only the U.S. tuna fleet, but was a major component of U.S. fleet expansion in the North Pacific and Bering Sea fisheries as well. Mortgages on 6 of the 11 insolvent vessels of the Zee fleet had been guaranteed under the FOG program, and it is reported that the guarantees for these vessels totaled $26.2 million (Woodworth and Ebisui, 1999). By 1996 the program was transformed into a direct loan program and no longer finances new harvesting capacity additions (Hogarth, 2001).

A major portion of the regular interaction between the U.S. purse seine fleet and the governments of the U.S. and the PICs is through the operation of the Tuna Treaty. Interaction between governments and the purse seine fleet is directed by the requirements of the Treaty, including flag state enforcement by the U.S. One aspect of the Treaty that calls for "broader cooperation" between the industry and the PICs is the subject of regular annual consultations where discussions are held on ways in which developmental activities involving the fleet can be pursued. The industry can of course pursue or develop commercial contacts or relationships with PIC governments, and has done so in the past.

The financial aspects of the Treaty are such that the U.S. vessels pay only a portion of the overall amount, with the U.S. government paying the remainder. It is the only such agreement of its kind in the region, and while the amounts are not insignificant to vessel owners, their costs under the Treaty represent a net savings over what might have to be paid for the same access under arrangements between the PICs and other fleets.[22]

4. CURRENT MAJOR INDUSTRY ISSUES AFFECTING THE FLEET

There are several issues facing the tuna industry as a whole that may have a large impact on the fleet's ability to survive. These issues are external to day-to-day vessel operation and primarily concern supply, trade, and marketing within the U.S. tuna industry. The problems and potential problems these issues generate have come about largely as a result of the increasingly global and highly competitive nature of the tuna business.

4.1 Supply

The term supply is meant here to simply mean the amount of tuna suitable for canning that is available to processors in the tuna canning industry worldwide at any given time. It is recognized that frozen whole tuna is a global commodity produced in many parts of the world. Depending on conditions of supply and demand, the various geographic areas of production can compete with one another in the market.

The state of such supply fluctuates considerably in the short-term, and the global nature of much of the tuna trading business enables some adjustment to be made. The larger picture however, is of overall increases in supply brought about by more and larger vessels and improvements in technology. In addition, slow or no growth in canned tuna consumption in the U.S. (which is the market for tuna canned in American Samoa) has created an oversupply of raw material and adversely affected global prices. Examples of such global prices are given in Figure 10.[23]

King (1987) has pointed out that when prices go down the productivity and efficiency of vessel operations become more critical. When a large number of vessels are able to increase production in an attempt to improve their own financial performance, a downward spiral results that increases the pressure on tuna prices and forces them even lower. The U.S. fleet is generally recognized as having increased its productivity since arriving in the Western Pacific. By at least one account the increase has been on the order of 35 percent.[24] Coan and Itano (2002) document the changes in catch rates and other vessel performance indicators caused by the fleet's shifting to fishing on schools associated with drifting Fish Aggregation Devices (FADs) (see Section 2.2.4). Their analysis, using landing records for fifteen U.S. vessels which fished continually during a twelve year period starting in 1988, compared the differences in certain performance indicators between two time periods—1989-1995 and 1996-1999. The results indicate an eight percent increase in catch per day, an 84 percent increase in catch per set, and a total catch increase of 11 percent increase between two time periods (Coan and Itano, 2002).

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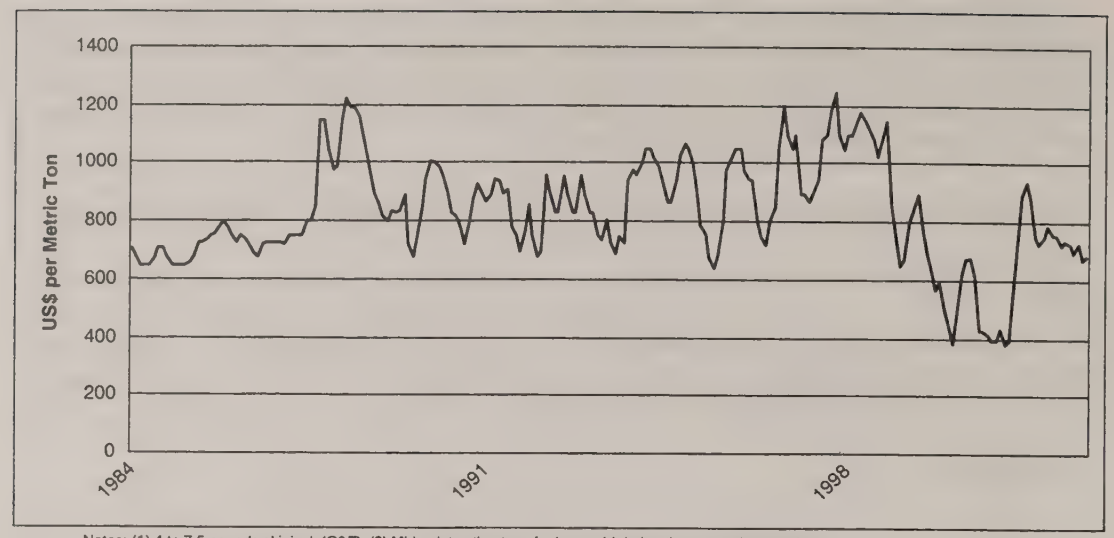
[22] The $3 million lump sum contribution of the industry is pro rated on the basis of the number of applicants and is currently around $120,000 per license; while figures provided in Gillett et al. (2001) suggest the Korean, Taiwanese and Japanese fleets paid from $225,000 to $270,000 per vessel in 1999 on the basis of existing fleet size at the time.

[23] The prices shown in the above table are indicative figures only. They reflect mid-point estimates of prices paid during the respective month as obtained from a range of sources.

[24] Comments of Chris Lischewski, President and Chief Operating Officer of Bumble Bee made in an interview with *Pacific Magazine*, July 2002.



Notes: (1) 4 to 7.5 pounds skipjack (C&F); (2) Mid-point estimates of prices paid during the respective month as obtained from a range of sources; (3) Information supplied by C.Reid, FFA

Figure 10. Mid-Point Estimates of Monthly Bangkok Prices for Skipjack, 4–7.5 pounds, 1984-2002

Prices in the global tuna industry are linked directly to supply. The fall in prices during 1999 and 2000 are believed to be a result of a combination of factors. Catches were very good on both sides of the Pacific.[25] Increases in fishing capacity, particularly in Ecuador, also contributed to the glut as the skipjack catch in the eastern Pacific nearly doubled from 141,000 tons in 1998 to 263,000 tons in 1999. At the same time, demand for canned tuna in the U.S. market was declining or nearly stagnant, having reached a low for the decade in 1997.[26]

When prices reached the point where catching and selling tuna to the canneries in American Samoa was producing serious financial losses, many U.S. vessels tied up and stayed in port during the months of May and June, and October to December 2000. This inactivity affected 35 percent of the fleet in May and June, 55 percent in October and November, and 87 percent in December (Coan et al., 2001).

Many in the U.S. industry have felt for some time that the obvious way to limit the supply of fish to canneries is to limit the number of boats. They have noted that increases in the number of vessels engaged in the western Pacific purse seine fishery and the resultant high totals of overall catch are one of the major causes of price decline. This feeling may be accentuated by the fact that while the U.S. fleet has declined in numbers since the middle of the last decade, other fleets granted access by PICs have increased in size. Those increases have been in apparent contravention of regional arrangements (to which the U.S. government and the U.S. industry are not parties). The U.S. government has attempted to bring the issue forward in recent discussions on the renewal of the Tuna Treaty. As noted above, an amendment to that treaty now requires the parties to consider the issue of capacity, "where appropriate."

In addition to the growth in some of the existing fleets other, newer participants have entered or are about to enter the fishery (some using Pacific Island flags of convenience) and it is the U.S. industry's view this will exacerbate the problem.[27] It is not without some irony that several of the

[25] In 1999 U.S. fleet CPUE (tonnes per day fished and searched) reached its highest annual level ever at 38 (SPC, 2001)
[26] U.S. per capita consumption for canned tuna was 3.1 pounds in 1997; it subsequently rose slightly, one tenth of a pound per year, for the next 3 years (NOAA, 2001).
[27] An example is the three-year agreement signed July 6 2002 between the European Union and Kiribati that allows from six up to 11 seiners to fish in Kiribati.

vessels used by some of the new entrants were purchased from U.S. fishing interests. One large Asian fleet is composed almost entirely of former U.S. purse seiners sold during the late 1980s and early 1990s when their U.S. owners reduced fleet size or exited the fishery.

One response to the crisis caused by an over-supply of fish on the global market was the formation of an international grouping of purse seine owners. In May 2000 they met and discussed ways in which they could combat the crisis. Informal discussions on the subject were held in May 2000 in Bangkok. Subsequent meetings in Paris in July and Manila in November further enabled the participants to discuss what kinds of action they might take. At the Manila meeting the vessel owners agreed to take voluntary steps to reduce supply to the market and to create to their own organization. By January 2001 the owners and their representatives were convinced that their voluntary measures (holding vessels in port after offloading for a specified period) had some positive impact on prices. This encouraged them further, and subsequently they formed the World Tuna Purse Seine Organization (WTPO) in Guayaquil Ecuador in March 2001[28] (Moron, 2002).

The WTPO is a unique and unprecedented response to a worldwide crisis by some tuna producers who believe they can exert an influence on the direction of the industry.[29] Their initial successes in contributing to recovering tuna prices have been followed by statements indicating efforts at broader action they feel will contribute to stability in the industry. In their latest resolution agreed in June 2002, the Asian members of WTPO reached the following agreements.

- Limit the number of purse seine boats operating in the Western and Central Pacific Region through the existing Palau Arrangement in cooperation with the Forum Fisheries Agency
- Attract and encourage membership to WTPO through cooperation with tuna traders and processors
- Implement a continuing catch reduction effort by extending the time in port for every vessel to ten days, every time they call to unload, when the average price of skipjack among Asian members goes below the acceptable level; to review this reduction effort every month provided all decisions on the agreed reduction should be effective for at least two months

The U.S. fleet does not participate in the WTPO. Several industry sources have stated that their lack of participation is the result of legal advice that such activity could be construed as violation of Federal U.S. anti-trust laws. While the U.S. fleet does not actively participate in the activities of the WTPO, their actions of mid- and late 2000 in staying in port preceded similar action taken by WTPO members. This lends credibility to statements by some U.S. vessel owners that while they cannot participate in the WTPO activities directly, they support such measures taken by the organization.

As can be seen by the WTPO's latest resolution, the members are planning on taking actions that would encompass a greater range of activities to "allow equilibrium among the world tuna resources and its exploitation in a rational, economic and efficient way" (Moron, 2002).

The reluctance of the U.S. fleet to participate in the WTPO may put them at some disadvantage in the future. To date, the fleet's only known activity in parallel with WTPO action was in undertaking longer port stays in an effort to reduce tuna supplies to canneries and drive up prices. If the WTPO continues to move in the direction of a cartel, however, it may become more difficult for the U.S. vessels to protect their own interests from the outside. For example, following a joint meeting in Kaohsiung in June 2002 a declaration was issued whereby WTPO members and tuna traders from Thailand, Taiwan and the Philippines agreed to the following.

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[28] The initial signatories included one U.S. vessel owner as well as vessel owners or their representative associations from Japan, South Korea, France, Ecuador, Philippines, Taiwan, Panama, Colombia, Spain and Venezuela.

[29] During an earlier crisis period at the beginning of the last decade, an independent U.S. fleet operator a meeting of purse seine owners worldwide that was held in Florida, but failed to galvanize owners into joint action.

- Create a joint technical and quality improvement committee to analyze and establish tuna fish quality specification of tuna fish delivery to the packers
- Exchange validated information and statistics about tuna catch, tuna production and tuna consumption on a global basis
- Maintain consultations in order to continuously analyze the world tuna market situation

It was also agreed that tuna traders, Philippine packers and Thailand packers would give preferential treatment to boat owners that comply with tuna fish quality specifications to be jointly established. If U.S. vessels are not involved in the setting of quality specifications, there could be a reduction in future marketing options for the fleet.

4.2 Trade

4.2.1 Andean Trade Preferences Act

Representatives of the tuna industry, including those who represent the vessel owners, are active in their efforts to lobby the U.S. Federal government on a variety of trade issues that affect their interests. Paramount among those issues addressed in recent months is the renewal of the Andean Trade Preferences Act (ATPA).

The ATPA originally went into effect in 1991 and grants special tariff treatment to the Andean countries of Bolivia, Peru, Colombia and Ecuador for many products. It is designed to combat drug processing and dealing in those countries, and is now in the process of being renewed. About 6,000 products were covered under the former ATPA, while several categories including textiles, petroleum and petroleum-derived products, footwear, clocks and watches in addition to canned tuna were excluded (Department of Labor, 2001). Ecuador is the largest tuna producer and exporter among the Andean countries, with more than half of the region's supply. Ecuador is also the second largest supplier of U.S. canned tuna imports behind Thailand, mainly because of investment by U.S. processors in canneries and loining plants. Ecuador has not had duty-free access to the U.S., but U.S. investment and its industry have grown in the last decade due to the access granted them in the European Union under an arrangement that has similar objectives as ATPA.

During mid-2002 the U.S. Congress deliberated on the renewal of the Andean Trade Preferences Act. The versions eventually passed by the House of Representatives and the Senate differed in the duty free provision for tuna. In late July 2002, the Congress passed the House-Senate conference report on trade legislation that includes the Andean Trade Preferences Act.[30] The final version of the Act does not provide any duty-free access of canned tuna, but does give the U.S. President authority to grant to Andean countries duty-free treatment for tuna packed in foil pouches, with the stipulation that the tuna must originate from Andean or U.S. vessels.

During early 2002 the entry of Andean-produced canned tuna duty-free into the U.S. under the ATPA was perceived by the U.S. fleet and much of the domestic industry as the largest single threat to the canneries in American Samoa and their major suppliers, the U.S. purse seine fleet. This threat has now been largely dissipated, and representatives of the U.S. fleet view the vessel of origin requirements as being a positive development.

There is some concern that the provision for duty free entry of tuna in pouches from Andean countries could eventually exert a negative influence on the canneries in American Samoa. Although pouched tuna represents a very small share of the U.S. market at present, it is expected to expand. Faleomavaega (2002) states "pouch products are expected to grow to an 8% share by 2005, 12.2% by 2007, and about 15.4% of total U.S. tuna trade by 2012. If these numbers hold, canning operations in American Samoa may suffer five years from now and we must be prepared in the case of this eventuality."

[30] This occurred during the finalization of the present report.

In the worst-case scenario American Samoa canneries would not be able to compete in the tuna pouch market because of the lower wages in the Andean countries. Industry estimates quoted in an economic study by staff of the U.S. International Trade Commission (ITC) (Corey and Babula, 2002) show American Samoa cannery hourly labor costs including benefits to be $3.75 per hour, while Ecuador's is $.77 per hour.

4.2.2 Importation of Canned Tuna from Mexico

The potential lifting of the ban on the importation of canned tuna from Mexico since it is caught in association with dolphins has been percolating for several years and could further complicate the situation.[31] The ban is considered by Mexico as a non-tariff trade barrier and accusations have been made that the environmental organizations opposing lifting of the ban have been encouraged to do so by some U.S. canners that are fearful of entry into the U.S. market of inexpensive Mexican canned tuna. Unlike the complicated situation in Ecuador where U.S. canners are producers, or in Thailand where the largest canner also owns a facility in American Samoa, there is no apparent U.S. canning investment in Mexico and their fleet is fully capable of providing a supply of raw material.

The U.S. Secretary of Commerce reportedly will rule on changing the dolphin-free label standard after the National Marine Fisheries Service releases a study this summer on the effects of tuna fishing on dolphins. It is highly likely that there will be court action taken by a major environmental organization, Earth Island Institute, if the Secretary rules that tuna netted with dolphins can still be listed as dolphin-safe. In 2000, environmental groups won a similar lawsuit after the Clinton administration sought to make changes to the dolphin-safe labeling requirements. If the Secretary rules against some relaxation in the dolphin-safe labeling requirements, Mexico and other affected nations have indicated they would file a complaint before the World Trade Organization. It has also been reported that Mexico has threatened to abandon dolphin-safe fishing techniques in the event of an adverse decision by the Secretary of Commerce (Atuna, 2002b).

4.2.3 Additional Trade Issues

While any statements about what might happen to the canneries when ATPA concessions over pouched tuna are granted to the Andean countries are purely speculative at this stage, several people close to this situation have stated categorically that American Samoa needs to plan for the day when the canneries are no longer viable.

In a speech to a legislative committee in American Samoa, Congressional Representative Eni F.H. Faleomavaega stated, "...Heinz Corporation/Star-Kist and Thai Union/Samoa Packing are not going to be part of our economy forever. I predict these canneries will leave American Samoa in another 7 to 10 years, if not sooner" (Faleomavaega, 2001). In a recent interview, the President and Chief Operating Officer of Bumble Bee expressed his own opinion, "American Samoa needs to start developing other industries. There is a shelf life for the tuna industry there" (Keith-Reid, 2002). These comments are indicative of a consensus on the future of the canneries currently expressed in the processing industry.

The government of American Samoa recognizes the situation, as exemplified by a statement in 2000.

> "Growth of the cannery industry over the last 40 years has been based largely on exemptions from U.S. foreign fishing landing restrictions, duty-free access to U.S.

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[31] Although it is recognized that dolphin mortalities which have dropped from 80,000 to 100,000 in the 1980s to under 3,000 today do not represent a threat to the future of dolphins in the Eastern Tropical Pacific, some environmental groups (mainly Earth Island Institute, but including others) maintain a policy that opposes any chasing, netting, or encirclement of dolphins during an entire tuna fishing trip and use those criteria to define "dolphin safe."

markets, corporate income tax exemptions, and a low minimum wage relative to the U.S.. For a variety of reasons, these artificial advantages are being overtaken by world market, supply and international trade conditions." (ASG, 2000)

Granting to Andean countries some degree of duty-free access to the U.S. market will have a negative impact on ASEAN canners as well. They are currently making strong representations to the U.S. for special consideration on the basis of, among other things, their support for anti-terrorist activities. The outcome of these efforts could also affect the American Samoa canneries.

One of the trade conditions that has been moving slowly forward since the first Bush administration is the creation of a "Free Trade Area of the Americas," or FTAA. The present Bush administration has reaffirmed their intention of proceeding with FTAA and in meeting a deadline of 2005 that was set by the region's leaders at the 2001 Summit of the Americas in Quebec City, Canada. Once in place the FTAA is intended to create a NAFTA-like trade environment that will encompass all 34 countries of North, Central, and South America (with the exception of Cuba).

While it is generally accepted that the closing of cannery operations in American Samoa may eventually occur, it is unlikely they would pull out quickly. One of the reasons is the proximity of American Samoa to productive fishing grounds that can provide a regular supply of fish, even if the U.S. fleet disappears. Another is the continuing trend in the industry towards the processing of loins. The volume of frozen, cooked loins brought to American Samoa for canning is unknown. At present, the loining plant in Majuro supplies StarKist skipjack loins that are equivalent to around 10% of its annual raw material supplies. Thai Union is believed to have imported loins into American Samoa in the past but now reportedly exports mainly yellowfin loins to Europe.

If the canneries shift to processing a higher proportion of loins rather than frozen whole fish, the U.S. vessels would have to adjust accordingly. Whether or not they would be able to do so is discussed further in Section 5.5.

There has also been some speculation that the canneries might shift to purely albacore processing. The small volumes involved in the canning of albacore relative to light meat tuna would mean a scaling-down of production and, of course, would not include the purse seine fleet as a source of supply.

4.3 Marketing

An effort by the canning industry to get the U.S. Food and Drug Administration to adopt a new "standard of identity" for canned tuna is seen by the industry as an important step in restoring consumer preference for canned tuna in the U.S. Unlike the ATPA, the standard of identity issue is a domestic one that relates directly to improving product quality and increasing consumer preference for canned tuna over other competing products. The canners recognize that the quality of canned tuna in the U.S. has suffered as they have reduced the amount of tuna required to fill a can by the use of additives such as broth and hydrolyzed protein that have reduced the product's appeal to consumers. The results have been lower sales and less growth in the U.S. market that has translated into stagnant demand and contributed to lower prices for fish.

The marketing arm for many U.S. purse seine owners, the United Tuna Cooperative, strongly urged the FDA in 2001 to adopt the new standard that would (1) require drained weights to be shown on the label, (2) place controls on the use of additives in canned tuna, (3) harmonize the standard of fill of containers for canned tuna with international standards, (4) require that the standard fill of a container for canned tuna is not less than 72% of the net weight of the container, (5) eliminate the "pressed weight" methodology for checking the fill of a container (Krampe, 2001).

In May 2001 the 3 major brands agreed on a new standard of identity and petitioned the FDA to make the necessary changes. The FDA, citing other priorities and more recently food safety

related to security concerns, has not taken action on this issue. Since no action has been taken on any of the industry's requests, the processors are now attempting a different approach. They have requested a "temporary marketing permit" from the FDA that will enable them to voluntarily take the steps required to improve quality. The key question is how private label foreign processors will react, and particularly whether the Thai tuna industry will comply (Lischewski, 2002).

The U.S. fleet naturally supports these initiatives that would require more tuna to be placed in the can, as it would immediately result in a greater demand for raw material. What is not known, but the point on which the industry is gambling, is whether the consumer will be willing to pay more for a higher quality can of tuna.[32]

5. FACTORS AFFECTING THE SURVIVAL OF THE U.S. FLEET

A great deal of uncertainty currently exists regarding the future of the U.S. purse seine fleet. The fleet's future, already clouded by the potential effects of the currently unresolved supply, marketing and trade issues described in the previous section, will also be affected by a large number of other factors. Many of these factors have been identified by discussions with various vessel owners, processors, fishery managers and other knowledgeable individuals during the research for this study. In many cases, differing opinions are held on the relative importance of these factors, whether or not they will play pivotal roles in the fleet's future, or even if they exist at all.

Some of the factors can readily be seen to exert a positive force on the fleet, contributing to its viability under current and potential circumstances in the industry. Other, negative factors appear as serious threats that may call into question the survival of a significant portion or all of the fleet. There are other, potentially important factors that as of now have not manifested themselves to the degree that enables them to be classified as a positive or negative influence on the ability of the fleet to survive. Their existence, however, adds further to the uncertainty and makes predicting the fleet's future that much more difficult.

The following are elements of the industry that exert a positive force on the U.S. purse seine fleet.

- The Tuna Treaty
- Resiliency of the fleet
- Existence of an operational base
- Existence of alternative fishing grounds
- Low debt levels
- Ties to tuna fishing
- Commitments of processors to increase demand for canned tuna
- Potential for increased efficiency
- Changing ownership arrangements
- Vessel of origin requirements in ATPA

Negative factors that can be construed as threats to the fleet are as follows.

- Low or stagnant prices
- Reduction or elimination of advantages for American Samoa as a processing location
- High cost of production
- New entrants into the western Pacific fishery
- Slowness in adopting foreign innovations
- Lack of generational continuity in vessel-owning families
- Age of the fleet

[32] In fact, much of the canned lightmeat tuna retailed in the U.S. is sold at deep discounts to encourage patronage of supermarkets and other outlets. It is assumed that this sales strategy would have to be adjusted to reflect higher wholesale prices based on increased raw material costs, and the impact on sales is unknown.

The following are currently considered potentially important factors that may arise in the future.

- Granting of duty-free access to the U.S. and/or EU markets to Thailand and/or the Philippines
- Restrictions on FAD use as a bigeye conservation mechanism
- Decreases in EU subsidies to their tuna fleets as a result of recent proposals to change the EU Common Fisheries Policy
- Greater success in WTPO attempts to create a cartel and thereby drive up tuna prices

5.1 Positive Factors Affecting the U.S. Purse Seine Fleet

5.1.1 The Tuna Treaty

The fleet has a very strong ally in the U.S. government, which has a vested interest in maintaining the Treaty and the good relations with PICs that it engenders. Not only has the Treaty improved relations between the U.S. and PICs, but it also provides other benefits to the U.S. government from several perspectives. It enables the government to get very good fishery management information from the fleet through access to fishery data and to further cooperation with the PICs and the FFA through the cooperative operation of an observer program. It also facilitates the government's implementation of flag state control. Indirectly, the existence of a U.S. presence in the fishery enhances the U.S. position when it interacts with other resource users (including Asian countries) in international tuna fishery discussions. The existence of the fleet can provide a broader basis on which to participate in such discussions than only the geographic position of its territories or the existence of its market.

Reduced cost of access paid by vessel owners, the "industry contribution," and free ranging access to multiple zones are perceived by many in the industry to be the main advantages of the Treaty. Compared to Asian fleets that must purchase fishing licenses separately for several jurisdictions and are required to pay fees to each, the cost of a license under the Treaty can be seen as a bargain.

From the fleet's operational standpoint, the ability to seek tuna schools over a wide geographic area is a key requirement in purse seine fishing. The access guaranteed under the Treaty enables vessels to move freely (with the exception of some internal archipelago waters and closed zones) within jurisdictions in order to adjust to changes in resource abundance and availability.

Administratively, the Treaty facilitates the fleet's activities rather than hinders them. For example, once they are licensed the vessels must contend with only one access administering authority and abide by one set of rules that governs access in all Pacific Island jurisdictions. While there are restrictions and requirements placed on the fleet, most of these are contained in the "minimum terms and conditions of access" adopted by the PICs and must be adhered to in any licensing regime. The long-term nature of the Treaty reduces transaction costs for the fleet, and assures access to a high degree.[33]

5.1.2 Resiliency of the Fleet

The U.S. tuna fleet has experienced many political, financial, and other shocks during its existence. It has shown a resiliency in many of these situations and has been able to rebound and overcome what were at the time significant obstacles to its continued existence. This is discussed further in Section 6.

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[33] As with any such agreement, there are, of course, circumstances in which the Treaty, and hence fishery access for the fleet, can cease to exist. The withdrawal of the U.S. or any of three key Pacific Island States (Federated States of Micronesia, Republic of Kiribati or Papua New Guinea) withdraw, or the withdrawal of a number of Pacific Island States that leaves fewer than ten States as parties would invalidate the treaty.

5.1.3 A Suitable Operational Base

With the move to the western Pacific in the 1980s most of the fleet became based in American Samoa, while what came to be known as the Zee fleet based in Guam. All owners today base their vessel activities in American Samoa, with the economics of their operations dependent upon direct delivery to the canneries there. In American Samoa the vessels enjoy some important benefits that should contribute to vessel efficiency and success.

Direct delivery to the canneries in American Samoa eliminates the need for and costs of transshipment. Since freight costs for transshipment are constant irrespective of fish price, the advantage of direct delivery is magnified during periods of low fish prices. American Samoa provides good port infrastructure, repair facilities, net and deck supplies and access to a labor supply for crewing. Unlike Guam, the port is not heavily used by the military or commercial traffic and is generally less susceptible to interruptions caused by hurricanes.

5.1.4 Existence of Alternative Fishing Grounds

As was shown in Section 2.2.4, basing in American Samoa also affords the opportunity to access newer and productive fishing grounds in and proximate to Tuvalu, Kiribati, and Tokelau that are relatively close. The proximity of these fishing grounds can translate into faster trips, less fuel consumption and when fishing on FADs, less need for a helicopter. In addition, under the extension of the Treaty it is expected that most of the waters of the Solomon Islands will likely be open to the U.S. fleet.

5.1.5 Low Debt Levels

Many boats in the U.S. fleet are reported to be carrying low levels of debt, with low or no mortgage payments. In 1998, McCoy and Gillett (1998) estimated that the age of the U.S. fleet and its ownership structure would likely mean that principals had been paid down over time, leaving a relatively small amount of debt on the vessels outstanding. At that time, interest expense was estimated at about half the cost of vessel insurance at the time and about two-thirds the cost of helicopter costs (McCoy and Gillett, 1998). While some vessels might have incurred some new debt in increasing capacity or purchasing new machinery, debt levels still most likely remain low. The low level or absence of debt can make a large difference in a vessel's ability to withstand longer periods of unfavorable financial return as compared to the past when many vessels reportedly carried high debt loads.

5.1.6 Strong Ties to Tuna Fishing

As was discussed in an earlier section, the vessel owners within the U.S. fleet consist mainly of people from fishing families in California that have been involved in the tuna industry for a long time. The historical, family, and even emotional ties to the operation of tuna boats that many of the owners have developed are understandable, given the nature of their self-reliant and close-knit community.[34] Although impossible to quantify or pinpoint, the attitudes engendered by their background and decades in the tuna business as vessel owners have left many with a "die-hard" attitude that plays at least some role in their continued involvement in the industry. If the financial conditions in the industry result in unfavorable profitability, it can be expected that at least some of these owners will want to stay "in the game."

This is not to say that these attitudes overshadow the fact that fishermen are in the business to make money, however. Owning or managing a tuna vessel that is essentially an $8 million or $10 million dollar asset involved in a business with 20-plus employees and revenues of $3 million to $5 million per year is not something that one does as a hobby. There must be some other elements (such as beneficial tax advantages or indications of future profitability) other than emotional ties that would motivate owners to remain.

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[34] See Orbach (1977) for what now is an historical look at the tuna fishing communities of San Diego.

Despite the fact that financial positions, emotional outlooks and subsequent commitments to the industry are assumed to vary among individuals, the one constant that appears to be present is that none will remain in the business to make a substantial loss over a protracted period. Some may, however, choose operation of a tuna seiner over more lucrative investments or opportunities as long as they are able to break even or produce a modest profit.[35]

5.1.7 Commitments of Processors to Increase Demand for Canned Tuna

Earlier, it was explained that the U.S. tuna processors are attempting to change the U.S. Food and Drug Administration's standard of identity so that less additives are placed in the can. This would result in more tuna being used to produce the same number of cans and to rebuild consumer preference for canned tuna.

The processors are also undertaking three other initiatives aimed at revitalizing tuna consumption in the U.S. In addition to tuna packaged in pouches, they are reportedly introducing or developing new food items that utilize tuna. The processors are also undertaking a test in selected markets known as a "category growth campaign" (Lischewski, 2002). This project consists of advertising that does not focus on any particular brand, but rather educates and informs the consumer about the product. Category growth campaigns have been undertaken in the U.S. for numerous food items, such as milk and beef. In Japan, such campaigns undertaken by the Federation of Japan Tuna Cooperative Association and other industry groups during the 1980s were instrumental in increasing the domestic consumption of skipjack products in Japan at a time when their industry's reliance on skipjack as an exportable canning material was evaporating.

5.1.8 Potential for Increased Efficiency

Many of the vessels active in the fleet today have been stretched to increase their capacity, but this option still remains for a few vessels. The ability to carry 300 t to 500 t more per trip can be important in achieving greater productivity and positively contribute to financial performance. Several of the vessels in the fleet have not undergone such modifications. There also appears to be room for innovation in refrigeration and fish loading and unloading following the Spanish and French examples.

5.1.9 Changing Ownership Arrangements

The U.S. purse seine fleet can be divided into two segments on the basis of ownership. As noted above, about two-thirds of the vessels belong to individual owners who are members of fishing families from Southern California. Although it is possible that more vessels in the U.S. fleet are likely to be sold, it may be that other U.S. interests are increasingly likely to be the buyers. About one-third of the vessels are now owned by the tuna trading company, TriMarine. The company's most recent fleet growth comes about through the purchase of vessels from non-U.S. sources and represents potential fleet additions.[36]

Consolidation of vessel ownership in this context could prove to be a positive element contributing to the fleet's survival and enhancing opportunities for greater expansion. Unlike the Zee fleet that failed in the last decade, TriMarine has a greater opportunity to succeed from increases in fleet size because of vertical integration. It is also not totally dependent on the income from the fleet and its business plan probably has a different focus than those of the previous vessel owners.

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[35] By definition, these "managing owners" usually profit from management fees that are charged against the vessel in any case.

[36] The vessels are reportedly undergoing repair and refurbishment, and the flagging intentions of the owners are not clear at present.

5.1.10 Vessel of Origin Requirements in ATPA

In Section 4.2.1 the implications of the Andean Trade Preferences Act were discussed. Briefly, it appears that the Andean countries will be provided duty-free access for only tuna packed in foil pouches. This is considerably less of a negative influence on the U.S. fleet than the expected duty-free arrangement for canned tuna. On the other hand, the stipulation in ATPA that the Andean pouch tuna must originate from Andean or U.S. vessels is viewed by U.S. vessel owners as a positive development as it is expected to generate at least some additional demand for tuna caught by U.S. vessels. The requirement will also limit the available markets for European vessels operating in the western Pacific Ocean (WPO) and help to minimize competition in the short term from Spanish seiners operating in the WPO.

5.2 Negative Factors Affecting the U.S. Purse Seine Fleet

5.2.1 Low or Stagnant Prices

Increases in global tuna harvesting capacity have resulted in catches growing faster than demand. This is especially evident since January 1999 and has continued to some degree thereafter in spite of attempts by the U.S. fleet and WTPO. The production elements that resulted in this trend, increases in fishing capacity and technical innovations being but two, show no signs of leveling off.

As the world's fleets increase their ability to put more tuna on the market, the shrinking U.S. fleet has less bargaining power with canners over tuna prices. Although it is the major supplier to the American Samoa canneries, it is estimated that the U.S. fleet now provides less than 5% of the world's light meat tuna supplies.

5.2.2 Reduction or Elimination of Advantages for American Samoa as a Processing Location

It is expected that the renewal of the ATPA will result in duty free entry into the U.S. of pouched tuna. While this is not an immediate threat to the canneries in American Samoa, the negative influence may grow as pouched tuna expands its market share. This could result in some scaling back of the American Samoa canneries and contribute lower ex-vessel tuna prices.

The tax benefits afforded U.S. corporations operating in American Samoa under current provisions of the U.S. federal tax code are set to expire in 2006. These benefits previously also applied to Puerto Rico, but were removed in 1996 and may have been one of the reasons contributing to the closure of all but one cannery there. It appears that obtaining the same or similar types of tax benefits will require a large lobbying effort by American Samoa and the industry as well as a sympathetic Congress.

Further on the horizon, the Free Trade Area of the Americas noted in Section 4.2.3 has been gaining momentum and, barring any major policy shifts by future administrations, could become a reality well within this decade.

5.2.3 High Cost of Production

The impacts of operating costs on profitability are, of course, related to both production and price. The vessel operators and others in the industry generally acknowledge that U.S. vessels incur high operating costs. For example, high wages have always been a requirement to attract the best captains and other key personnel. The requirements of U.S. law to employ U.S. citizens as master and chief engineer add to personnel costs that might otherwise be mitigated by the hiring of non-U.S. citizens in these positions. Insurance costs are also very high, mainly because of the existence of U.S. laws that increase liability, but also partly because of the past loss history of the fleet.[37]

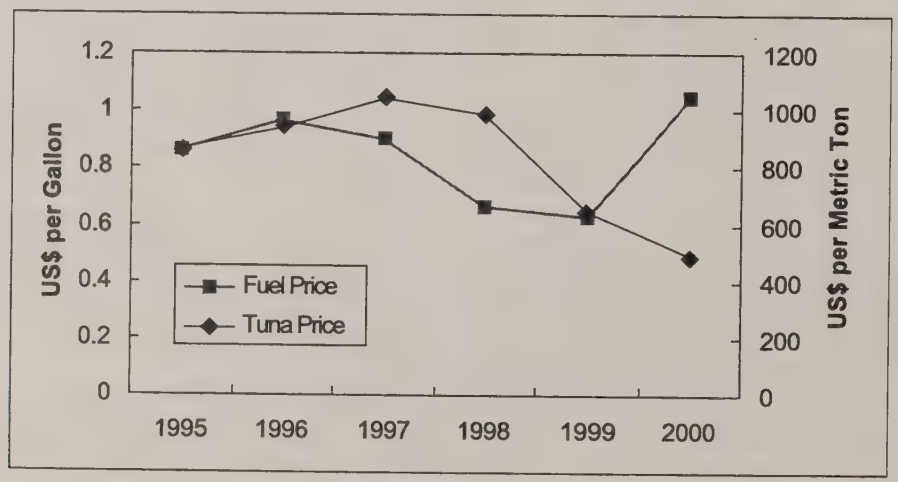
[37] McCoy and Gillett (1998) give a more complete discussion of purse seine vessel operation costs.

Fuel costs have historically been the second largest operating expense of U.S. purse seiners in the western Pacific. Vessels can benefit when fuel prices drop more quickly than the fish price, but that situation usually doesn't remain for very long. More typically, vessels are usually able to absorb some increases in fuel prices as long as fluctuations in the price are reflected in the price of fish. During situations where fish prices drop precipitously at the same time there is a steep rise in fuel price, the difference between the two can have a large impact on operations. Figure 11 documents the most recent example in the divergent high cost of fuel and low fish price that occurred in mid-2000.

The level of some other, smaller, costs are simply a reflection of the manner in which U.S. vessels are operated, and the belief of their owners that this is the way it is done. For example, U.S. purse seine vessels have a reputation for high quality and large quantities of food served on board. Consequently galley expenses on U.S. vessels are high. Because waiting times for unloading in American Samoa can be prolonged, vessel owners provide time off and transportation back to the U.S. mainland to captains and sometimes other crew.

5.2.4 New Entrants into the Western Pacific Fishery

One of the greatest concerns expressed by the U.S. Government and fishing industry regarding new entrants into the fishery is the added production they represent, and the potential detrimental impact that may have on prices. For the last several years there have been worries expressed about the European fleet's potential activities in the western Pacific, particularly the Spanish fleet who have been most active. Other new entrants include New Zealand and China, both of which have purchased vessels from the U.S. fleet. Of particular concern are the fleets that could expand and that might possess large subsidies, or not base their operations on market forces.



Sources: Fuel – Anon 2001; Fish – as per Figure 10

Figure 11. Fuel and Fish Prices

With added vessels in the fishery, irrespective of subsidies or economic system under which they operate, competition will increase. Competition among fleets in the western Pacific purse seine fishery can exist on many levels. Fleets compete for fish on the fishing grounds, for competent crew on shore, and in the market when selling fish. The U.S. fleet does not welcome any of these.

5.2.5 Slowness in Adopting Foreign Innovations

For many decades the U.S. tuna fleet led the world in tuna fishing innovation. At least to some extent, the tuna purse seine fleets of Asia and Europe have either copied U.S. designs and techniques or employed U.S. machinery that was developed as a result of U.S. fishing experience and expertise.

After spearheading the development of numerous operational and technical improvements through the years it appears that, in general the fleet has been slow to adopt innovations or improvements from other fleets. Examples of technological improvements that were slow to catch on with the U.S. fleet include the use of snap rings or roller rings, Spanish-style brailing, and the use of rail or side rollers that are an integral part of the quicker Spanish-style sacking up and brailing operations. Some electronics also fall into this category, in particular Doppler current meters that were manufactured and used by the Japanese for years to avoid conditions that might contribute to net "roll-ups" before being adopted by the U.S. fleet.

Many improvements are adopted, but the difficulty some of participants in the fleet have in early adoption of these innovations can, in time, result in the loss of a very important competitive edge for the fleet as a whole.

5.2.6 Lack of Generational Continuity in Vessel Ownership

In the western Pacific tuna fishery, vessel ownership has been described as the most competitive, risky, and low profit segment of the tuna commodity chain (Schurman, 1998).

It appears that few of the next generation of vessel-owning families are entering the tuna business. Whether the reasons for their reluctance are the result of a rejection of the tuna fishing lifestyle, an aversion to the highly competitive and risky business environment, or better business opportunities elsewhere, is unknown and not really relevant. What does appear relevant from discussions with participants and observers of the tuna industry is that there are fewer intentions (or opportunities) for current individual owners to pass the businesses on to younger family members. This lack of continuity has the potential to influence decisions on the part of owners to divest themselves of vessels.

5.2.7 Vessel Age

As noted in Section 2.4.1, the average age of the fleet is currently 23 years old. Age can reduce a vessel's profitability because maintenance costs tend to increase. The actual amount of fishing time lost to time in port for repairs is dependent to a large degree on the level of maintenance and machinery replacement employed by the operator. During periods of low or no profitability in the fishery, vessel owners tend to defer all but essential machinery replacement and can cut back on maintenance.

5.3 Potentially Important Factors in the Future

The list of factors in Section 4.0 that might become important and which may exert either positive or negative influences in the future is not exhaustive. The list is representative, however, of the kinds of issues that may have the greatest impact in the longer term. These issues include further expansion of free trade, restrictions on resource use, efforts towards a more level playing field among fishery participants, and increases in the ability of vessel owners to determine prices.

5.4 Identification of the Most Serious Threats

The preceding discussion highlights the large number of threats facing the U.S. purse seine fleet in the western Pacific fishery. It is necessary to point out that these factors, either negative or positive, may not affect all vessel owners in the same manner or to the same degree. For example,

the removal of cannery ownership from the fleet has left the individual owners as a relatively isolated segment of the commodity chain, whereas the vessels owned by TriMarine remain linked to other segments through activities of the parent company that may enable them to mitigate some of the negative forces.

For some of the issues that give rise to the threats discussed in the preceding sub-sections, there are countervailing forces that would tend to ameliorate their negative impact on the future of the fleet. The two most relevant of these subjects are the adoption of foreign innovations and age of the fleet.

Although the loss of any competitive edge by the U.S. fleet can be considered a threat, and while the fleet has been slow to adopt some innovations developed elsewhere, it is recognized that once embraced, the experience of U.S. fishermen and (for lack of a better word) savvy, enables them to make the most of such new methods or technologies. While there is no denying that older vessels can represent a serious liability to the fleet in terms of its overall competitiveness and production capabilities, on the positive side it is understood that many of the vessels do not carry very high debt loads and can better withstand periods of unfavorable financial returns.

In comparison with the existence of mitigating factors for the two threats to the U.S. fleet just enumerated above, at the current time there are no strong positive forces that appear to counteract the threat of new entrants into the western Pacific fishery.

It is not at all certain that current management arrangements are up to the task of controlling either the pace or magnitude of these new entrants. A recent study by the University of the South Pacific noted.

> "Some Pacific Island States have recently broken ranks with regional agreements, especially regarding the management of the purse seine fishery, by licensing flag of convenience vessels and vessels from new entrant distant water fishing nations." (Tarte, 2001)

Although the U.S. government is pursuing efforts to emphasize the fishing capacity issue in its ongoing fishery relationships with the PICs as resource owners, the results of these efforts are yet to be seen.

The potential for new entrants or the expansion of the fleets of those countries that have recently entered the fishery is dependent upon political and economic factors that may change with time. While it is not inevitable that all parties currently interested in the fishery will eventually become major participants, the current success of the European Union and China in obtaining fishery access for tuna purse seine fishing in the western Pacific are indicators of an unlikely continuation of the status quo.

In the absence of any controls on catch in the western Pacific, the main negative consequence for the U.S. fleet of new entrants or the further expansion of existing participants, would likely be further downward pressure their production would exert on tuna prices.

Prices for cannery-grade frozen whole tuna result from a combination of many factors. These include the global supply of tuna produced by fleets worldwide, consumer demand for the end product, tariff and trade barriers of the consuming nations, transportation costs, and so forth.

The major determinants of profitability in the fishery are tuna prices and cost of production. For the individual vessel or fleet, low prices can be partially or completely offset by a combination of higher production (larger total catch) or lower costs of that production. The chance for significantly higher production on a fleet-wide basis in the short- to medium-term is, however, low. Although catch does seem to be rising over longer time periods, it can be looked at

as a fairly small incremental rate.[38] Increases to catch per set and catch per day fished in recent years seem to be related directly to FAD use (Coan and Itano, 2002). Since FAD sets generally produce greater quantities of smaller, less valuable tuna, the impact of increases in production on profitability would tend to be diminished. The most recent information indicating that there has been a return to vessels setting more on free-swimming schools with the intention of catching higher value sizes of tuna. This points to an inability to increase production based on FAD fishing as a means to offset lower prices.

The chance for vessel owners to significantly lower their costs of production seem to be out of reach, given the foregoing discussion in Section 5.2.3. While some smaller cost categories could conceivably be reduced, most of the major cost items are beyond the ability of vessel owners to control.

The fleet cannot continue to operate in the manner it currently does if American Samoa does not exist as a market. The threat of reduction or elimination of advantages for American Samoa as a processing location therefore represents a major threat to the fleet's survival.

An underlying serious threat that can be combined with any or all of the others is the lack of generational continuity in vessel-owning families. This serious threat remains somewhat hidden in the background, and while perhaps not as easily quantified as the other serious threats, can and will have a strong impact on many owners' decisions to remain in or leave the fishery.

In summary, the following are the most serious threats to the continued viability of the fleet.

- Continuation of overall low or stagnant prices
- High costs of production
- Reduction or elimination of advantages for American Samoa as a processing location
- Lack of generational continuity in vessel-owning families

5.4.1 Low or Stagnant Tuna Prices

Low or stagnant prices for canning raw material are, as has been noted earlier, a global problem owing to the increase in catches worldwide. Downward or stagnant trends in tuna prices do not necessarily have the same level of impact on all national purse seine fleets, however. While the WTPO membership moves ahead with measures to curb production and thereby raise prices, several of its members have recently increased their fleet size. The Philippines, for example, reported a 20 percent increase in its tuna purse seine fleet between 1998 and 2001 (Tiu-Laurel Jr., 2002). During roughly the same period, attrition in the U.S. fleet was almost 20%. Another WTPO member, Taiwan, has continued to build vessels to a point where its fleet now numbers over 50, including vessels locally based in PICs.

While some fleets have managed to increase in size at the same time the U.S. fleet has been shrinking is a reflection of several factors. The fishery is highly sensitive to changes in price and production, and the general outlook of the participants is that being profitable is a matter of surviving the poor times to hopefully be in a position to profit greatly in the good times (McCoy and Gillett, 1998). Independent operators with relatively limited financial resources are the most likely to be unable to sustain prolonged periods of depressed prices. Thus, for the U.S. fleet, low or stagnant prices have a significant negative effect and their continued existence at levels experienced since 1999 represents a major threat for at least the short-term.

5.4.2 High Costs of Production

Some fleets other than the U.S. fleet have been able to sustain their numbers or grow in the face of low prices because of their low production costs. In 1998 it was estimated by one of the authors that annual salary costs on a Philippine purse seine operation in a PIC were around $180,000 per annum, or only 20 percent of annual salaries on a typical U.S. purse seiner. The

[38] Hypothetically annualizing the rate of increase in total catch shown in Coan and Itano (2002) of 11% in comparing the periods 1989-1995 to 1996-2000, would give about a 2% annual increase in total catch.

vessels used their own company's dry dock in the Philippines, had very low access fee costs, spent just $3 per man per day on food, and did not carry hull insurance. In comparison, a typical U.S. vessel would have to set aside $150,000 per year or more for dry dock accrual, pay over $100,000 in access fees, perhaps another $100,000 in galley expenses, and upwards of $400,000 to $500,000 in annual insurance costs.

A study in 1998 that used an identical tuna price to calculate estimated revenue for both a typical Japanese and typical U.S. purse seiner found that while both delivered directly to processors and incurred no transshipment fees, the break-even price for the Japanese vessel was $102 per metric ton less than that for the U.S. vessel (McCoy and Gillett, 1998). The Japanese example had far less insurance costs and repair and maintenance costs, owing mainly to the relatively young age of the fleet, and somewhat lower management and general and administrative expenses.

These two examples are representative of the high production costs that continue to be incurred by the U.S. fleet. These high costs make the fleet less competitive, and amplify the negative effects of low prices.

5.4.3 Reduction or Elimination of Advantages for American Samoa

Decreases in American Samoa's advantages as a processing location is a longer-term threat that may affect the territory's continued existence as a viable processing site. The anticipated immediate threat to the canneries in American Samoa by duty-free access for canned tuna under ATPA did not eventuate. In the longer term, the predicted growth of the U.S. market share of tuna in pouches could have a negative impact. Faleomavaega (2002) comments on the growth of tuna pouches and states "canning operations in American Samoa may suffer five years from now."

It would not take total closure of the canneries in American Samoa to eliminate that market for the catch of U.S. purse seiners offloaded directly. As American Samoa's labor costs continue to erode its other advantages, an option available to the processors is to intensify their use of loins and less whole fish. This would reduce the percentage of relatively high cost American Samoa labor in the final product that may be enough to sustain the operations. A switch to using more loins, however, would reduce the need in American Samoa for the whole tuna produced by U.S. purse seiners. A further possibility is for the canneries to focus on the processing of albacore. While this would maintain at least some level of production at the canneries, it would not result in a continuation of the ability of the seiners to deliver their catch.

The longer-term threat of total closure of the canneries and elimination of American Samoa as a processing venue still exists, even if it is able to weather the ATPA storm. The planned elimination of federal tax advantages in 2006, the expansion of NAFTA and the FTAA, possible granting of duty-free status to imports from ASEAN nations, and the entry of other low wage countries such as China into the industry, are all additional threats that will have to be overcome or neutralized.

5.4.4 An Underlying Threat: Lack of Generational Continuity in Ownership

A common underlying threat to the future of the fleet that may occur with any one or a combination of the three major threats noted above is that few of the next generation of vessel-owning families are entering the tuna business. While this lack of generational continuity and the resultant disappearance of some or many of the current vessel owners are considered real threats to the fleet in the medium to long-term, it would not necessarily spell the demise for the entire fleet. A change in the composition of some vessel ownership with a larger amount of U.S. corporate or conglomerate participation could result, using vertical integration and the economies gained with consolidation to reach greater profitability. The degree, however, to which larger corporate owners will want to expand their fleets is also highly dependent on their abilities to withstand the three major threats of price, high cost of production, and the suitability of American Samoa as a gateway to the U.S. tuna market.

5.5 Options Available to the Fleet in Addressing the Most Serious Threats

The majority of responses available to the vessel owners to address the most serious threats confronting them can be expected to take the form of business management decisions tempered by the factors described above. Such management decisions fall into two broad categories—operational and strategic. Operational management decisions are those that are short-term and generally focus on activities on a day-to-day basis. In comparison, strategic decisions are usually taken over a longer time horizon and can represent all or a part of larger strategy.[39]

Actions could also be taken that do not necessarily fall into either of these categories, but nonetheless represent attempts to attain business management goals. An example of such action is the current lobbying of the U.S. government by the vessel owners or their representatives for specific legislative, political, or administrative action. Examples of the subject matter in each category include the Tuna Treaty, and the FDA standard of identity.

For the vessel owners, determination of what course(s) of action to take is dependent to a large degree on the perceived impacts of current industry issues on their existing operations and plans for the future. It should be understood that in trying to maintain profitability in what has become an increasingly complicated business environment, while vessel owners most likely perceive the impact of issues in the same way, not all would be expected to make the same decision or take the same course of action.

5.5.1 Short-Term Options to Address Major Threats

Although the first two major threats, the existence of low or stagnant prices and high cost of production are directly related to profitability in the fishery, the short-term options available to vessel owners to attempt to lessen or minimize their adverse impacts are presented separately. There is little operational action that can combat the third major threat, that of the reduction or elimination of advantages of American Samoa as a processing location.

5.5.1.1 Low or Stagnant Prices

1. More effort could be focused on catching more large yellowfin (larger than 10 kg) and to target larger sizes of skipjack (larger than 3 kg). This would likely entail a reduction in the concentration on FAD fishing, and a return to more targeting of free-swimming schools.

A reduction in FAD fishing and return to fishing more on free swimming schools would likely result in "performance parameters such as catch per day fished and catch per set returning to levels experienced during past periods with reduced FADs" (Coan and Itano, 2002). The overall impact on gross revenue might be positive, with the greatest effect when large quantities of greater than 10 kg yellowfin are caught. Since yellowfin tend to make up the highest percentages of total catches during El Niño years, climatic conditions could heavily influence the success of such a strategy.

While there is usually a positive price differential favoring large yellowfin (larger than 10 kg), the market for whole, frozen yellowfin has generally shrunk as more European producers such as Italy now import only frozen, cooked loins and the competition for the Japanese canning market has intensified with the increase in Asian fleets.

[39] It may be that some owners, having grown up in a profession where, as Orbach (1977) points out, risk, uncertainty and luck is the way they make their living, do not have a larger or strategic outlook.

2. The vessels could remain in port and thereby reduce cannery supply of raw material. Produce less.

The fleet response to low prices in late 2000 and early 2001 was to remain in port. It appears, however, that the objective of such action was avoid incurring operating costs greater than revenue from fish sales. The response did not appear to be an effort to force prices up in the manner of WTPO's activities since those months. The realistic situation in American Samoa is that the canners have far more sources of supply than the boats have outlets for their fish. This is particularly true for the vessels that are contracted to one of the two canneries.[40]

In the past there has been some mention of the cannery strategy of squeezing the fleet on price but not to a point that vessels are driven out of business. In this interpretation, the basis of this strategy was to get fish at the lowest possible price, but preserve sources of supply. Since the global supply situation has provided greater options for the supply of fish to American Samoa canneries, either the strategy has not been applied at all, or has been applied but has failed to achieve its goals, given the continued attrition in the U.S. fleet.

3. The fleet could take action more in concert with WTPO in coordinating the extended periods in port and relating directly to fish price, thereby magnifying the actions of the U.S. fleet.

The WTPO's recent declarations have indicated a greater agenda to try to limit increases in capacity and maintain a supply situation conducive to stable prices. While these activities could be seen to be in the best interests of all current purse seine operators, including the U.S., there has been little apparent movement on the part of U.S. owners to act in concert with WTPO. This may be indicative of an attempt to obtain short-term benefits in the form of higher prices without making the required sacrifices of additional days in port, or an inherent distrust of the intentions of the other fleets, (which, until recently it should be pointed out, did not trust each other). If no way is found around the legal restrictions to U.S. vessels joining WTPO, and if the views of WTPO held by some of the key U.S. operators do not change, the activities of WTPO may not be able to contribute to attempts to combat low prices paid the U.S. vessels.

5.5.1.2 High Cost of Production

1. Further reduction of discretionary fishing expenses could be implemented.

Very few expenses are discretionary, but some are, including crew salaries, travel, galley expenses, and a few others. According to vessel owners, they have cut back about as much as they can. Even though crew costs can represent the largest single expense component for a U.S. purse seiner, and the costs of employing a captain or fishing master and chief engineer can easily represent one-third or more of total crew salaries for 20 person crew, there is reluctance to cutting further than what owners say they already have done. Owners have a particular vested interest in their top crew, who represent years of irreplaceable experience in the fishery, and are the key element to success. The owners recognize that employment opportunities still exist, both in the U.S. and in foreign fleets, particularly those fleets that have purchased former U.S. vessels.[41] If future limits placed on the number of vessels in the western Pacific fishery are taken to a point at which there is a significant loss of job opportunities in key crew positions, owners might be more willing to reduce salary costs more.

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[40] The number of vessels with contractual arrangements to deliver fish to the canneries in American Samoa is not known, but is presently probably at least half the fleet. It is believed that five of the seven vessels that left the fleet in 2002 were contracted to deliver to the canneries.

[41] It is worth noting that when the Japanese distant-water longline fleet reduced its fleet size by 20 percent in 1998, an almost instant pool of highly skilled fishing captains became available, with many obtaining employment in other longline fleets that competed directly with the remaining Japanese vessels.

2. Capacity might be added to individual vessels. Produce more.

Whether adding capacity to an existing vessel is practical is a matter for each vessel owner to decide. Capacity in some of the vessels in the fleet has not been increased, and the addition of even four wells, could increase fishing power and overall catch. As has been noted earlier in this report, the ease and cost of adding capacity to purse seine vessels is directly related to the design of the vessel, with those where engines are near the stern being the least expensive to modify. At the present time, it appears that only three out of the twelve vessels in the fleet that have not undergone modification are in that category, with the rest requiring a greater level of engineering and hence cost.

A second important factor in considering whether or not to add capacity is the manner in which an owner might finance the undertaking. Depending on vessel configuration and a host of other factors, a modification to increase fish hold capacity by four wells, and possibly make resultant changes to the mast and deck equipment, would cost from $1.2 million to $1.5 million. Greater increases in capacity would, of course, cost more.

5.5.1.3 Reduction or Elimination of Advantages for American Samoa as a Processing Location

If this occurs, in the short-term the vessels will have few options other than to seek alternative markets for their catch. A few may be able to offload at canneries in the Philippines or at loining plants in the Pacific Island region. The distances and logistics involved for regular deliveries to canneries in the Philippines, however, is a major hurdle. There is also a large question as to whether or not a market would even exist there for the catch of a large number of U.S. purse seiners. As noted earlier, the Philippine purse seine fleet has expanded in recent years while the overseas markets for canned tuna from the Philippines are constrained by tariff barriers. Three of eleven tuna canneries on Mindanao have ceased operations since 1999, and the remaining are operating at 60 to 70 percent capacity due to a lack of markets, not fish (Tiu-Laurel, 2002).

The current loining capacity in the Pacific Island is not conducive to providing a market for the production of U.S. purse seiners. While many plans have been put forward, only two plants presently exist in the region. One is a small plant in the Marshall Islands that accepts about 12,000 t to 14,000 t per annum. The second is in Fiji and is involved mainly with albacore. It is reported that U.S. processing interests have pulled out of plans to build a loining plant in Papua New Guinea, leaving the Taiwanese former partners to determine its feasibility.[42]

The expansion of a market in Ecuador to purchase the production of U.S. seiners will depend to a large degree on the increases in sales of pouch tuna in the U.S. and the availability of tuna in the Eastern Pacific Ocean. If the market expands and fewer fish are available to Andean vessels, U.S. vessels will have the option of either delivering directly or via transshipment. If this is the case then a repositioning to fishing in the Eastern Pacific will most likely be required. As discussed below, this option is not practical for most, if not all, vessels.

The option of operation as a transshipment fleet will require some longer-term planning that is discussed below.

5.5.2 Longer-Term Options to Address Major Threats

The longer-term responses to the major threats require strategic decisions. An example of such a decision was the one taken 17 years ago by the fleet and the U.S. government to negotiate the Tuna Treaty to address the threat of lack of fishery access.

In the longer term, there appears to be little that the vessel owners can do on their own to address issues of price and cost of production, other than continue to support the efforts others.

[42] Several Taiwan purse seiners have already been granted access as domestically-based vessels in Papua New Guinea on the basis of their being the major suppliers to the proposed loining plant.

For example they can support the efforts of the U.S. government aimed at encouraging capacity limits in the fishery in the hope of reducing raw material supply. The fleet could, however, have several options available in response to the major threat of reduction or elimination of advantages for American Samoa as a processing location.

The following options have been identified and are discussed below.

- Consider becoming an itinerant transshipping fleet
- Attempt to remain based in American Samoa as a transshipping fleet
- Move operations to a base in one of the PICs and seek fishery access in the region other than under the Treaty
- Withdraw from the fishery

5.5.2.1 Consider Becoming an Itinerant Transshipping Fleet

The first of these options is for vessels to focus on transshipping similar to the Korean and Taiwanese fleets in the western Pacific, where it is estimated that 11 different Pacific Island ports were used for transshipment by purse seine vessels in 2000.

Making the transition to a transshipping fleet would require several major adjustments to the manner in which the vessels are operated. In order to be successful as a transshipment vessel, it is necessary to absolutely minimize the amount of time spent in port. The added days at sea, and hopefully larger catch, can therefore assist in offsetting transshipment costs. The efficiency of Taiwanese and Korean transshipment operations is enhanced by the increased number of crew used to sort the catch at sea as well as to act as stevedores in port during transfer operations. Both of these fleets are believed to obtain the vast majority of such additional crew from low wage countries such as China. One of the advantages to obtaining crew in China for fishing operations in the western Pacific is the long distance away from home and the high probability that crew will remain for the entire contractual period (normally 3 years)

The U.S. fleet would have to develop contacts and the means of hiring this or other very low wage labor to augment existing crews. If such crew must be obtained in Asia, it can be expected that it would be more expensive to acquire than the Asian vessels, since they are able to usually engage them while in their home ports about once every three years. This would be a shift for the U.S. fleet, which generally hires lower skilled crew on a voyage-to-voyage basis. If the U.S. fleet obtained additional crew at comparably low wages from PICs, there would be comparably higher risk of losing them than, say, Chinese crew due to the proximity of Pacific Islanders to their home countries.

A disadvantage of transshipment in the Pacific Islands rather than delivery to American Samoa is the lack of repair and support facilities at some major transshipment ports. The need to either wait for parts or expertise to arrive, or to travel to a port where these are available, can place older or less well-maintained vessels at a disadvantage and contribute to delays that adversely affect available fishing days.

The transition to becoming a transshipping fleet would not be easy for many U.S. vessels. It would entail initially higher overhead costs to set up and manage the logistics, and crews would have to adjust to different cycles of leave, vacation time. U.S. vessel crews who are used to mostly having the fish offloaded for them by stevedores at the cannery would have to offload their own catch in transshipment ports.

In order to keep up with the Asian fleets, high levels of per day offloading would have to be achieved and maintained, and for some older vessels this may require addition of equipment to enable faster turn-around times in port.

5.5.2.2 Attempt to Remain Based in American Samoa as a Transshipping Fleet

This option assumes that the canneries remain but do not utilize the production of the U.S. purse seine fleet. If the canneries continued to process whole albacore, it is possible that some of the supply and support facilities will remain (such as the dry dock and machine shops). If the

vessels continue to utilize fishing grounds relatively close to American Samoa, there may be an advantage for them to transship in American Samoa.

This scenario may be practical during El Niño years, when the fishery moves farther away from alternative transshipment ports in Tarawa and Majuro (see Figure 4). In El Niño years, on the basis of Figure 4, fishing could be as close as two days' steaming from American Samoa. Fishing on FADs in non-El Niño years, such as is represented by Figure 5 extends the transit time from two to five days. Neither of these areas are as far away from American Samoa as the fishing areas utilized before 1996, as shown in Figure 3, where transit time would be a week or more.

Because the choice of port for transshipment is determined by proximity to fishing grounds, it would appear that American Samoa would be relatively desirable during El Niño years but only somewhat desirable when fishing on FADs during non-El Niño years. However, these ports are not practical if fishing returned to the areas farther to the northwest, i.e. Papua New Guinea and FSM.

5.5.2.3 Movement to a Base in One of the Pacific Island Countries and Seek Access Other Than Under the Treaty

The fishery access regimes for tuna purse seining in the western Pacific are operated under the frameworks of bilateral agreements, a multi-lateral arrangement for the Parties to the Nauru Agreement (PNA), and the multilateral Tuna Treaty for U.S. flag vessels. The PNA countries have had a licensing regime in place since 1994 called the Federated States of Micronesia Arrangement for Regional Fisheries Access, the "FSM Arrangement."[43] The objective of the arrangement is to encourage basing of vessels in the PNA countries. Access is granted under a point system whereby points are given for vessels meeting certain requirements such as local investment in the enterprise, the use of local management, contribution to local government revenue, local offloading, purchasing of fuel, employment of nationals and so forth. Points are awarded on a sliding scale for each criterion, with a minimum of points required to qualify for access. Access to the fishery zones of the PNA countries is granted on an annual basis only, with license fees currently roughly equivalent to those paid by industry under the Tuna Treaty.

The FSM Arrangement was put in place prior to policy and legal changes in several of the PNA countries that now make it somewhat easier for vessels to qualify for access under the arrangement. To date, in addition to a few vessels actually owned by interests in the PNA countries themselves, two and perhaps more vessels with beneficial ownership held by a U.S. firm are licensed under the arrangement, as are several Taiwanese and a Japanese.

One direct impact of licensing an essentially U.S.-owned vessel under the FSM arrangement rather than the Treaty is to increase the pro rata share of the required industry contribution for the remaining U.S. vessels operating under the Treaty. There are also other potential impacts, mainly to crewing (no U.S. citizens are required to be part of the crew), and to American Samoa (the possibility of fewer trips terminating there).

The costs incurred in taking advantage of access under the FSM Arrangement can be summarized as follows.

- Higher license fees for a smaller number of zones, as the PNA does not include all FFA members
- The need to create and register an owning company, set up an office, provide certain management functions from the PNA country, and purchase a certain amount of supplies locally to demonstrate benefits to the host country
- Flagging and ownership requirements differ in each of the countries that might sponsor a vessel under the FSM Arrangement; for example in FSM, domestically-flagged vessels must

[43] The PNA countries consist of Palau, Federated States of Micronesia, Marshall Islands, Nauru, Papua New Guinea, Solomon Islands, Kiribati and Tuvalu. The Forum Fisheries Agency acts as the PNA secretariat and manages the administrative aspects of the Federated States of Micronesia Arrangement.

commence or end a majority of their voyages in the country—this could cause problems if fishing activities occurred far from the FSM zone

There are other considerations that an owner must make when placing a vessel under a foreign flag. Foremost among these is that the laws of the flag state apply, and some owners may not be comfortable with having their vessel subject to those laws. While fishery legislation is usually fairly straightforward in the PICs, the business and taxation laws are not necessarily so.

5.5.2.4 Withdrawal from the Fishery

Even getting out of the fishery can pose a problem. Tuna purse seine vessels are unique in their construction and highly specialized. They are not easily adapted to other fisheries and a fairly narrow market exists for used vessels. Even if an owner were to decide to leave the fishery completely, the timing of his departure would depend to a degree on the status of the market (vessels are worth much more when tuna prices are high) and the existence of ready buyers.

6. HISTORICAL SHOCKS TO THE U.S. FLEET

The U.S. purse seine tuna fleet has been subjected to a number of shocks during its half-century history. In fact, the fleet came into existence largely from a shock to the predecessor bait-boat fleet. It is thought that a review of the various shocks and how the fleet responded or adjusted could provide insight into how the fleet may cope with the present situation in which the future existence of the fleet is in question.

The major shocks to have affected the U.S. purse seine tuna fleet are as follows.

- Tuna price drop—late 1950s
- Management controls—mid/late 1960s
- Mercury—mid 1960s
- Botulism—mid 1960s
- Dolphins—mid and late 1970s
- Access problems—late 1970s and early 1980s

The following represents a synthesis of views on these shocks from management agency staff, vessel owners, and tuna industry representatives, as well as a limited review of relevant literature (Sakagawa, 1991; Felando, 1987).

6.1 Late 1950s Tuna Price Drop

After WW II the activities of the Japanese tuna fleet were geographically restricted by boundaries known as MacArthur Lines. These limits were progressively relaxed and in April 1952 all restrictions were removed. By the late 1950s Japanese tuna vessels had expanded into the eastern Pacific and much of the increased tuna production was for the U.S. market, leading to a price drop. This was a major shock to the U.S. tuna fleet, which consisted of bait-boats that could not compete with the low costs of Japanese tuna fishing. Faced with this major threat, U.S. fishermen responded in a number of ways, including experimenting with new fishing techniques. Tuna purse seining was developed,[44] and proved effective in competing with the low production costs of Japanese tuna vessels. Starting in the late 1950s about 100 U.S. bait-boats converted to purse seine gear and the U.S. tuna purse seine fleet was born. In summary, it appears that the U.S. tuna fleet was able to survive the shock of the tuna price drop by technical innovation in conjunction with determination and ingenuity of the fishermen.

[44] The first U.S. tuna vessels to use purse seine gear were those of Lou Brito and Larry Zuanich.

6.2 Management Controls

In 1966 management controls were instigated in the traditional eastern Pacific fishing grounds of the U.S. fleet. By 1969 the fishing season in the eastern Pacific was open for only 106 days during the entire year. Faced with this situation, part of the U.S. fleet responded by extended fishing activities to the area off the coast of West Africa.

6.3 Mercury

Mercury is a naturally occurring element; large predatory fish from certain areas can contain levels of mercury harmful to humans. Concern over the health implications of mercury concentrations in tuna led to regulatory action by the U.S. Food and Drug Administration (FDA) in the mid-1960s. These restrictions and subsequent negative consumer reaction were a severe blow to the U.S. fleet. The fleet responded by changing fishing patterns (avoiding certain areas and large fish) and by solidarity with the tuna canners; successful lobbying by the combined forces of U.S. canners and U.S. boat owners resulted in relaxing the government mercury standards. In 1969, FDA set a 0.5-part-per-million action level as the maximum safe limit for total mercury in fish.

6.4 Botulism

Tuna is a low acid food and, when improperly processed, there is a danger of botulism poisoning caused by a toxin produced by the bacterium, *Clostridium botulinum.* In the mid-1960s there were several cases of botulism poisoning from canned tuna. The subsequent consumer rejection of canned tuna resulted in lower tuna prices and a shock to the U.S. tuna fleet, as well as the U.S. tuna canners. As with the mercury shock, one of the factors in the survival of the U.S. fleet through this difficult period was solidarity with the tuna canners. Through combined efforts, a recovery strategy was devised which included learning from a similar poisoning problem in the cranberry industry, buying out the facilities of the originating canner, and positive publicity for canned tuna.

6.5 Dolphins

In the 1960s the U.S. public became aware of the large amount of dolphin mortality associated with tuna fishing in the eastern Pacific. In response the U.S. government in 1972 passed the Marine Mammal Protection Act and in 1975 the regulations became stricter. The restrictions placed a tremendous hardship on the U.S. fleet, which some observers consider as their greatest shock. According to fishery managers at that time, the response of the fleet was to develop techniques that would reduce dolphin mortality while simultaneously aligning themselves with the canners. This allowed them to obtain sufficient political power to negotiate a dolphin mortality limit with the U.S. government that was high enough to allow fleet survival.

6.6 Access and Related Problems

In the late 1970s many coastal states began declaring extended economic zones. In 1978 Inter-American Tropical Tuna Commission attempted to negotiate a fisheries access Treaty covering the eastern Pacific which recognized coastal states rights, but was unsuccessful due to U.S. government objections. The subsequent difficulties of access to fishing grounds were a major shock to the fleet. This was compounded by low catch rates due to a breakdown of

management controls. One response of the fleet was to move to new fishing grounds in the western Pacific. This move was further encouraged by another shock to the fleet, the severe El Niño of 1982-1984 during which fishing in the eastern Pacific was very poor.

6.7 Consideration of Past Shocks

The above brief review of six major shocks to the U.S. fleet indicates several common responses, which mitigated the negative effects. These responses included the following.

- Technical innovations
- Determination and ingenuity of the fishermen
- Moving to new fishing areas
- Solidarity with the canners—more resources for mitigation and more power to influence government decisions

There is some doubt that these measures which have been effective in the past are applicable to the present difficulties of the U.S. fleet, the most serious of which appear to be low or stagnant prices due to global over-production and high operation costs relative to other purse seine fleets. Technical innovations could certainly overcome some of the present difficulties, but with the present reduced fleet size at less than one-quarter of what it was in the mid-1970s, there are far less people to innovate than in the past. The determination and ingenuity of the fishermen has been dulled somewhat by lack of generational continuity—many of the exiting key participants are aging and their children are often not interested in remaining in the fishing business. Moving into new fishing areas is less of a possibility than in the past due to growth of other fleets, both distant water and national. Solidarity with the canners is not as great as in the past as the canners move away from being fishing companies to entities which may have interests quite different from the fleet. The shrinking of the fleet and associated industries also results in less political power

There are, however, other concepts that should be considered. Several individuals with long involvement with the U.S. fleet stress that during many past shocks to the fleet it was thought that the difficulties were insurmountable and the fleet would not survive. In the words of one industry representative "the fleet has been counted dead and gone many times before." The ability of the fleet to emerge from seemingly intractable difficulties should not be under-estimated.

7. CONSIDERATIONS ON THE FUTURE OF THE U.S. FLEET

Considerations on the future of the U.S. fleet are conceptually divided into three categories.

- Opinions expressed by other studies and individuals
- What can be stated with some degree of confidence as an outcome of the present study
- What can be speculated from information in this report and from other sources

7.1 Opinions Expressed by Other Studies and Individuals

From late May through June a large number of individuals were interviewed in the course of gathering information for the present study. These were mostly with important stakeholders in the U.S. fleet and included present and past U.S. vessel owners/managers, fishing vessel operators, representatives of several tuna processing companies, representatives of the U.S. tuna industry, and tuna fishery managers from the U.S. government and from inter-governmental organizations.

Each of these individuals was either asked about, or volunteered views on, the medium-term (one to five year) future of the U.S. fleet.[45] Almost all of the opinions fell into one of four categories.

- Stabilizing of fleet size with corporate acquisition of the vessels sold by individual owners
- Decrease in fleet size to the point where only the "die hards" remain and then a stabilization in numbers
- Rapid decline of the fleet to zero because of some major negative event like the duty-free entry of canned tuna initially proposed in earlier versions of ATPA
- Continuing downward trend in vessel numbers, subject to an unexpected occurrence that could change the situation completely, for either the better or worse

A large amount of documentation relevant to the U.S. purse seine fleet was assembled for the present study. Views on future of the fleet were notably scarce in this literature. The documented speculation is given below.

In a recent study of the 2001 U.S. purse seine fishery, three knowledgeable individuals commented on the future of the fleets.

> "...the fundamental requirements for long-term sustainability of the U.S. fishery continue to be a healthy resource and dependable markets. Recent indicators of resource health and markets suggest increased uncertainty in these fundamental requirements for a sustainable fishery. The collapse of ex-vessel price in 2000 and 2001 demonstrated that the tuna market is sensitive to excessive global production and more than sufficient fishing capacity is available to meet those production demands. The SCTB in 2001 sensed some weakness in stock condition and recommended caution in further increases of fishing mortality on yellowfin tuna and bigeye tuna in the central-western Pacific region. Finally, fishing capacity and production in the region appear to be on the upswing, which will contribute to increased fishing pressure and competition." (Coan et al., 2002)

The U.S. International Trade Commission completed a study of the likely impact of the Andean Trade Preference Act (Section 4.2.1) in May 2002 and, after reviewing comments on the draft, issued a revised report in July 2002. One section of that report dealt with the effects of ATPA on the U.S. purse seine fleet.

> "This analysis suggests that a quota at the lower end of the range[46] would not significantly impact the purse seine sector as a whole — although, some vessels probably would be forced out. A large quota, especially complete duty-free treatment, could possibly lead to elimination of U.S. canners' demand for whole tuna (as they convert to loin processing). This would cause some vessels either to seek alternative markets or to exit the industry. Alternative markets include the growing Andean industry, whose demand for U.S.-harvested tuna would be materially increased by a country-of-origin restriction on the flag of the vessel harvesting the tuna canned for duty-free treatment. "Exiting" the industry typically entails sale of the boat to a foreign buyer, which also could be located in an Andean country but is as likely to be in one of several other Pacific Rim nations. Older, smaller boats probably would be scrapped." (Corey and Babula, 2002)

[45] It should be noted that these comments were obtained prior to the renewal of APTA, which in its modified form is considered to be a positive development for the fleet.

[46] The amount of canned tuna allowed under ATPA to be imported into the U.S. duty free

An interview with the President of a major tuna processing company appeared in a regional magazine.

> "You will see probably in the next 10 years the United States will be out of purse seining," he told Pacific Magazine after signing the extension of an agreement for buying tuna loins from the Levuka-based Pacific Fishing Company cannery in Fiji. "There used to be over 50 boats. I think they are down to 32. There are a couple of powerful groups coming out of it. TriMarine just bought the entire StarKist fleet... They have staying power, but I think over time it is going to be difficult to sustain the United States fleet. I just don't see a lot of investment and growth." (C. Lischewski, President, Bumble Bee Seafoods Inc., in *Pacific Magazine,* Keith-Reid (2002)

7.2 What can be Stated with Some Degree of Confidence

Using information and insight obtained during the study, it is possible to make a number of statements with some degree of confidence relevant to the medium-term future of the fleet.

The major factors causing the downward trend in U.S. vessel numbers appear to be low tuna prices, high costs of production, reduction of advantages for American Samoa as a processing location, and lack of generational continuity. Many of these influences are likely to persist in the future, although unexpected developments cannot be ruled out, with the positive influence of ATPA being an example.

Other statements that can be made include the following.

- The downward trend in the number vessels in the fleet cannot be disputed. A simple extrapolation of the present trends indicates that the fleet size would reach zero during the present decade.
- Although the U.S. fleet has emerged from many apparently intractable problems in the past, an examination of how the fleet did cope with those shocks indicates that many of those measures may not be applicable to the present difficulties.
- Historically, most the events that have had a major effect on the U.S. fleet (both negative and positive) have been largely unforeseen. An important lesson of the past is that conditions affecting the fleet can change quickly.

7.3 Speculation on the Short, Medium, and Long-Term Future

Depending on one's perspective and knowledge of the industry from other sources, the information contained in this report could lead to a wide range of hypothetical future scenarios for the U.S. tuna purse seine fleet. Speculating on the fleet's future requires making some guesses on the outcome of a multiplicity of issues affecting the future of the industry as a whole, as well as conjecturing on the resultant responses of processors and others to those outcomes. The following discussion should be read with all of these points in mind.

One of the most important determinants of the fleet's future is that of price, including any effects brought about by changes in the ATPA trade regime. If skipjack prices rise to levels of 1996-1998 and stay consistently above $800 per t, there will probably not be much attrition in the fleet in the next one to three years. With a weak El Niño predicted this year, there could be increases in yellowfin catches that could enable vessels to survive in the short-term, even if skipjack prices go somewhat below that figure. If, however, the skipjack price drops into the range of those experienced in late 2000, there could be a large number of vessels that would not be able to overcome their high production costs and would tie up as they did in late 2000 and early 2001. The severity and longevity of such a price drop will determine how many vessel

owners sell their boats, with the financially weakest and those with the least generational continuity being the first to do so.

The continued availability of a market does not guarantee that the fleet will survive intact at its current level, however. As the American Samoa canneries gradually switch over to the utilization of loins rather than frozen whole fish to lessen their labor costs, the U.S. need for the purse seine production will shrink. The increased use of loins from distant processing locations such as Thailand, for example could hasten and amplify this effect, while the development of more loining plants in the Pacific Island region close to the fishing grounds could provide an outlet for the seiners' catch.

Depending on their perceptions of the speed with which these developments will take place, individual owners that own multiple vessels may choose to sell one or more of their vessels and consolidate in an attempt to remain viable. On a fleet-wide basis, such consolidation would consist of selling the oldest or least productive vessels, or combining such sales with stretching of the remaining vessels.

A greater amount of speculation is required to predict what might occur in the longer term of five to ten years. If a significant number, say half the fleet, are able to survive the potential hurdles in the next five years, then there is a good chance they would last longer. Whether or not the vessels of individual owners would remain under current ownership during that time span is difficult to predict. The issue of generational continuity may be most prevalent at that stage and ownership could pass to corporate owners.

Irrespective of the time frame, there are two segments of the fleet that could outlast the others. The first are the "die-hards" who have other than strictly financial reasons to stay involved and who also have other sources of income. Second is the corporate-owned fleet that, if it remains intact, has the greatest latitude to adjust operations and access alternative markets through its parent company.

8. MANAGEMENT AND RESOURCES IMPLICATIONS

A discussion of the management and resource implications of changes in the U.S. western Pacific purse seine fleet is complicated by several factors. From the above sections it can be seen that the future of the U.S. fleet is not easy to predict and is subject to the dynamics of the fast-moving global tuna industry. Another uncertainty is that two major tuna management regimes covering the western Pacific, the Palau Arrangement and Western and Central Pacific Fisheries (WCPF) Commission, are undergoing major modification and evolving, respectively.

- The Palau Arrangement is an effort to limit the number of purse seiners licensed to fish in the zones of eight PICs. An initiative is presently underway to alter the arrangement so that fishing days, rather than the number of seiners, is the factor under limitation. It is not likely that this change will be effective before the end of 2003.
- The WCPF Commission was established by the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean that was opened for signature at Honolulu in September 2000. Under this new regime even the basic mechanisms for tuna management have not yet been agreed upon, much less implemented. For example, whether the Commission's role and powers applies to both high seas areas and EEZs, or just high seas, a fundamental issue, has not yet been clarified (Tarte, 2001).

Bearing these uncertainties in mind, some comments on the management and resource implications of changes in the U.S. fleet can be made. To do so, it is useful to establish two possible fleet scenarios. In one the number of vessels in the U.S. fleet stabilizes at a level somewhat lower than at the present. In the second scenario the number of vessels continues to decline and the fleet ceases to exist within the present decade.

8.1 Scenario 1—Vessel Numbers Decrease and Then Stabilize

The U.S. purse seine fleet caught about 125,351 t in 2000 and 115,524 t in 2001. In the year 2000 (the latest year for which catch data from the other fleets is available) the U.S. fleet caught about 12% of the tuna landed by seiners of all nationalities in the western Pacific and 7% of the tuna landed by all gears in the region (Coan et al., 2001). The U.S. fleet share in 2001 is likely to be lower. With a fleet size 25% lower than that of 2000, the U.S. fleet share is likely to dip below 10% of the purse seine catch if the number of non-U.S. seiners continues to grow, as present trends suggest.

With such a small share of the catch, there would be some question as to whether the U.S. fleet could be considered to be a major player in the fishery and whether, for example, conservation controls on the fleet would have a significant impact on tuna resources. In such a scenario, any U.S. Government management objectives for the western Pacific tuna fishery as a whole would become less effective through controls on the U.S. fleet. The U.S. Government would then have to consider other options for achieving its management objectives. These might include advocating measures under a broader management regime or through other procedures such as trade sanctions.

The management implications of the complete demise of the fleet are covered in a section below. The situation that might exist if there were a small number of active U.S. vessels would be quite different and deserves separate consideration.

The main management instrument governing fishing by U.S. purse seiners in the western Pacific is the U.S. Tuna Treaty. Although both the Pacific Island parties and the U.S. are satisfied with the financial terms of the Treaty, as indicated by the agreement to extend the Treaty for ten years from June 2003, there is no guarantee that the U.S. will continue to support such an obligation if the fleet size continues to shrink to just a small number of vessels. The government might try to avoid the perception of providing a large subsidy to a small number of vessel owners. This is ironic because, with a small number of vessels actually covered by the Treaty, the fixed amount contributed by vessel operators is spread over fewer vessels making contribution per vessel relatively large. On the other hand, because the Treaty has been an efficient conduit of U.S. Government funds to a large number of PICs, there would be justification to keep the Treaty in place. In such a situation, an attempt would probably be made to continue the Treaty arrangement in a way to get around the negative financial implications associated with a small fleet but still preserve the positive regional influence of the Treaty. Such adjustments might be made internally by the U.S. and have no impact on the Treaty's operation. If adjustments require broader action, the mid-term review of the Treaty, scheduled for 2008, may be significant.

Another management implication of a shrinking U.S. fleet, and indeed one that has already occurred, is that it can be used as justification by PICs for allowing new entrants into the western Pacific purse seine fishery. Although such new entrants were discouraged by regional fisheries management arrangements, the shrinking U.S. fleet has apparently played a major role in the decision by some PICs to allow additional entrants. Since many of the new entrants or new fleets appear either to be highly productive or possess the capabilities to become so, the catch potential they represent may be disproportionately higher than the U.S. fleet. The net effect could be that purse seine fishing effort could increase in face of a regime designed for limitation.

The U.S. fleet provides very good data on the fishery. It is generally acknowledged that the information requirements of the Treaty produce the highest quality and most complete data of any of the purse seine fleets of the region, with the largest observer program to verify such data. Another management implication of a shrinking fleet is that less of this high-quality information will be obtained.

In considering the above fisheries management implications of some further attrition in the U.S. fleet in the future, the possibility of increases in effort and a reduction in good fisheries data would seem to be the most likely events to occur.

8.2 Scenario 2—Fleet Ceases to Exist Within the Decade

If the present trend in vessel numbers is extrapolated into the future, there appears to be a real possibility that the fleet will cease to exist within the present decade. Although there is no mention in the Treaty of what might happen if this eventuates, from a practical standpoint it is difficult to see how the Treaty would continue in its present form. This would have several negative implications for fisheries management and the tuna resources of the western Pacific, including the following.

- In Section 8.1 above, it is noted that the U.S. fleet produces the highest quality data of any of the purse seine fleets of the region. Without any U.S. purse seine vessels in the region, the amount and quality of scientific and operational data on the western Pacific purse seine fishery would suffer a substantial decline.
- The Treaty has produced a favorable environment with respect to the collection of fisheries data, level of observer coverage, distribution of economic benefits, compliance, information on high seas fishing, use of a vessel monitoring system, flag state responsibility, and other items. With the encouragement of, and conditions contained in the Treaty, the U.S. fleet has become a yardstick by which the other tuna fleets of the region are judged. Without the Treaty the standards applied to other foreign vessels by the FFA member countries would likely be much lower.
- The high level of flag state responsibility required by the Treaty is beneficial to the PICs in the management of the fishery and further sets a standard for the region.
- For many PICs one of the objectives of management of the tuna fishery is to generate government revenue. For over half of the PICs the Treaty provides most of the access fees (Gillett and Lightfoot, 2002).
- The Treaty has indirectly supported a variety of tuna fishery management initiatives among PICs. For example, the various meetings regularly supported by the Treaty result in a gathering of PIC fishery officials that can use the opportunity to "piggyback" additional meetings to discuss other fishery management initiatives. In many countries, Treaty revenue has been used for supporting fisheries management initiatives, with attendance at the meeting leading to the United Nations Fish Stocks Agreement (UNFSA) and the Western and Central Pacific Fisheries Commission being examples. Furthermore, the Project Development Fund established under the Treaty is intended to promote fisheries management and development work.
- With the demise of the Treaty and with the soon-to-be-established Western and Central Pacific Fisheries Commission, there may a need to re-examine some of the operations of the Forum Fisheries Agency.[47]

In the absence of a purse seine fleet, the issue of whether the U.S. Government would remain engaged in the management of the tuna fisheries of the western Pacific is important. The best indication of any post-fleet management involvement by the U.S. Government comes from similar experience in the eastern Pacific. The U.S. was historically a key player in tuna fisheries management in that area when its tuna fleet was large and active. At present, the U.S. remains a major role in eastern Pacific tuna fishery management through the I-ATTC and other means, despite the fact it has virtually no fleet fishing in that area. This supports the view that in

[47] As Treaty administrator, the FFA operates a division dedicated to its management and derives a portion of its operational funds from the treaty.

principle the U.S. Government supports good management of fisheries despite the presence or absence of a U.S. fishing fleet.

Other factors that would contribute to the continuation of U.S. fishery management efforts in the western Pacific are that the U.S. has a tuna longline tuna fleet in Hawaii, a developing longline fishery in American Samoa and an albacore troll fleet that operates in the WCPO. In addition, the U.S. is still the largest single-country market for canned tuna, and the U.S. can use this as leverage in furthering its management goals (as it does with the dolphin issue, for example).

The above carries the strong suggestion that the U.S. Government would continue to be active in the management of the western Pacific tuna fishery should its purse seine fleet cease to exist.

The character of the U.S. Government involvement may, however, change. U.S. purse seine fleet representatives have historically been well represented in U.S. delegations to tuna management meetings relevant to the western Pacific. Those delegations have increasingly had representation from conservation groups. With the absence of fleet representatives on the delegations to balance some of the zealous views of conservation groups concerning such topics as marine mammals, sharks, turtles, and by-catch, there is the possibility that the influences that normally act on the formulation of official U.S. position would become heavily slanted on many issues. This may result in U.S. positions becoming somewhat more conservation/protection oriented.

Other fishery management and resources implications of having no U.S. purse seine fleet in the western Pacific include the following.

- With the worldwide pressure on tuna resources, it is inevitable that vessels from other countries would wish to move into the vacuum created by the departure of the U.S. fleet. Although the PICs have expressed a desire to reduce effort to increase license fees, past experience suggest that a lack of solidarity between countries to do so could be a problem. It is likely that other vessels would move in to replace the U.S. fleet, especially those from the Philippines and Europe.
- The U.S. fleet is presently either reluctant or restricted from joining the WTPO. If the U.S. fleet no longer exists, that organization would become more representative of the active purse seine fleet worldwide. Recently the WTPO members resolved to encourage limitation on the number of purse seine boats operating in the Western and Central Pacific Region through the existing Palau Arrangement in cooperation with the Forum Fisheries Agency.
- One of the most likely future restrictions for tuna conservation purposes in the region may be on fishing on FADs. As U.S. vessels leave the U.S. fleet, potential buyers exist in both the western Pacific and eastern Pacific. If vessels are sold to buyers in the western Pacific, particularly to the Philippines or new entrants such as China, it is likely that the catch of juvenile yellowfin and bigeye will increase as a result of fishing on FADs and other floating objects.
- The Philippine purse seine fleet's operation in the western Pacific is based almost exclusively on anchored FADs. They have already begun to purchase former U.S. vessels from Korea, and have greatly increased their fleet capacity in recent years. With limited FAD fishing areas in the Bismarck and Solomon Seas areas of the western Pacific, it is probable that Philippine purse seine effort with an expanded fleet would extend eastward from their current fishing grounds.

9. SUMMARY AND CONCLUSIONS

Fishing fleets of many nations participate in the tuna fisheries of the western Pacific. For effective tuna fisheries management in the region, knowledge of these tuna fleets is important.

Detailed information on the dynamics of the fleets is, however, sometimes difficult to obtain. This includes awareness of their history, interest groups, various factors affecting their operation, and forces influencing their future.

In 1976 the U.S. purse seine fleet consisted of 143 large vessels, of which about 98% were operating in the eastern Pacific. By 2002 the situation had changed considerably. Less than 35 vessels remained in the entire fleet, with almost all vessels based in the western Pacific.

This shift in base operations by the U.S. purse seine fleet from the eastern Pacific to the western Pacific can be roughly separated into four phases.

- Exploratory phase (pre-1980)
- Expansion and development phase (1980-1988)
- Early treaty phase (1988-1995)
- Recent period (1996–present)

With respect to fishing patterns of the U.S. fleet, until recent years fishing activities were concentrated in the west of the region in the PNG and FSM zones during non El Niño periods. During El Niño periods activity characteristically shifted eastward towards Kiribati and Tuvalu. After a weak El Niño in 1995-1996, sets on drifting objects became an important fishing strategy. Since that period U.S. vessels have characteristically remained in eastern areas in both El Niño and non-El Niño years.

There are several key issues of concern to the U.S. fleet and the associated interest groups. One of the most important is the worldwide oversupply of cannery grade tuna. Also significant is Latin American countries' access to U.S. tuna markets, especially the positive and negative implications of the newly renewed Andean Trade Preferences Act and that associated with U.S. importation of Mexican canned tuna. The possibility of a new U.S. FDA "standard of identity" for canned tuna is also important because its adoption would require processors to increase the amount of tuna put into cans.

The U.S. fleet's future, already clouded by the potential effects of these unresolved supply, trade, and marketing issues, will also be affected by a large number of other factors. Some of the factors can readily be seen to exert a positive force on the fleet, contributing to its viability under current and potential circumstances in the industry. Other, negative factors appear as serious threats that may call into question the survival of a significant portion or all of the fleet.

Factors exerting a positive force on the U.S. purse seine fleet are as follows.

- The Tuna Treaty
- Resiliency of the fleet
- Existence of a suitable operational base
- Existence of fishing grounds proximate to the operational base
- Low debt levels
- Strong ties to tuna fishing
- Commitments of processors to increase demand for canned tuna
- Potential for increased efficiency
- Changing ownership arrangements
- Vessel of origin requirements in the Andean Trade Preferences Act

The negative factors that can be construed as threats to the fleet are as follows.

- Low or stagnant prices
- Reduction or elimination of advantages for American Samoa as a processing location
- High cost of production
- Lack of generational continuity in vessel ownership
- New entrants into the western Pacific fishery
- Slowness in adopting foreign innovations
- Vessel age

The U.S. purse seine tuna fleet has been subjected to a number of shocks during its half-century history. A review of the various shocks and how the fleet responded or adjusted provides some insight into how the fleet may cope with the present situation in which the future existence of the fleet is in question. An examination of the six major shocks to have affected the U.S. purse seine tuna fleet indicated that the fleet was largely able to cope with these shocks by technical innovations, ingenuity of the fishermen, moving to new fishing areas, and solidarity with the canners. It appears, however, that many of these measures may not be applicable to the fleet's present difficulties.

The major factors causing the downward trend in U.S. vessel numbers appear to be low tuna prices, high costs of production, reduction of advantages for American Samoa as a processing location, and lack of generational continuity. Many of these influences are likely to persist in the future, although unexpected developments cannot be ruled out, with the positive influence of ATPA being an example. An important lesson of the past is that important conditions can change fast for the fleet.

Speculation on the future of the fleet requires making some guesses on the outcome of a multiplicity of issues affecting the future of the industry as a whole, as well as conjecturing on the resultant responses of processors and others to those outcomes. Bearing this in mind, these are some events that may occur.

- *Prices*: If skipjack prices stay consistently above $800 per t, there will probably not be much attrition in the fleet in the next one to three years. If the skipjack price drops into the range of those experienced in late 2000, there could be a large number of vessels that would not be able to overcome their high production costs and would exit the fishery.
- *ATPA*: The threat of unlimited duty-free access for canned tuna from the Andean countries did not eventuate. The country of origin requirements will be beneficial to the U.S. fleet, at least in the short and medium-term. The longer-term implication of a growth in the market share of tuna in pouches could negatively affect the canneries in American Samoa.
- *Markets*: The relatively high labor costs in American Samoa indicate a move to using a higher proportion of tuna loins, and less frozen whole fish that the U.S. fleet provides, causing some shrinkage of markets with downward pressure on prices.

In the longer term, the composition of the fleet is likely to evolve. It will probably be made up more of corporate-owned vessels and vessels owned by individuals who have reasons other than strictly financial ones to stay involved. This change may be similar to what has occurred in the U.S. agriculture sector, with evolution from family-owned farms to agro-business ownership.

Likely changes to the U.S. fleet have several management implications. A significantly smaller fleet than that of the present would probably result in less leverage by the U.S. Government in western Pacific tuna management, lower quality of data on the overall purse seine fishery, and increases in purse seine effort of the region. A complete demise of the fleet would dictate the end to the Treaty, at least in its present form. Other management implications are likely to include reductions in fishery data quality and quantity, standards of behavior by the other tuna fleets, and benefits received by PICs for fisheries access.

There are several indicators, including experience in the eastern Pacific where the U.S. fleet has only a very small presence that the U.S. Government would continue engagement in the management of the western Pacific tuna fishery should its purse seine fleet cease to exist.

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Appendix: Chronology of Events Relevant to U.S. Purse Seining in the Western Pacific

1917	Hawaiian Tuna Packers cannery opened in Honolulu. (Hudgins and Pooley, 1987).
1917	36 tuna canneries were operating in southern California (May, 1937).
1921	American Fishermen's Protective Association formed in San Diego. The name was changed in 1929 to the American Tunaboat Association. (Felando, 1987).
1936	A U.S. baitboat, *Cabrillo*, made the first venture by a U.S. tuna vessel to the Marquesas Islands in the central Pacific (Felando, 1987).
1937	Japanese commercial interests in Micronesia that had established pole-and-line fishing fleets, refrigerator plants, drying sheds, and canneries on Saipan, Palau, Chuuk and Pohnpei beginning in the early 1930s exported 6,000 tons of dried skipjack *katsuobushi to* Japan (Peattie, 1988).
Early and mid-1940s	Most of the U.S. tuna fleet leased or bought by the U.S. government for the war effort (Orbach, 1977). Many Americans with tuna fishing experience were exposed to the untapped potential for tuna fisheries development in the central and western Pacific.
1948	The *Alaska*, a 100 ft purse seiner owned by the Pacific Exploration Company and operating under a contract to Reconstruction Finance Corporation, surveyed the Marshall and Eastern Caroline Islands for tuna. No sets were made and it was concluded that the cruise was made at the wrong time of the year (Smith and Schaefer, 1949).
1948	The *Oregon*, a 100 ft baitboat owned by the Pacific Exploration Company and operating under a contract to Reconstruction Finance Corporation, surveyed the Mariana, Yap, and Palau Islands for tuna and baitfish. Results were poor (Smith and Schaefer, 1949).
1949	Harold Gatty (an aviation pioneer), using connections obtained by being the navigator aboard the first circumnavigation flight, acquired Rockefeller Foundation money ($1.5 million) for a cannery in Pago Pago. The cannery was not able to operate profitably on an inconsistent supply of tuna, processed only 6 tons of fish, and soon closed (R. Gatty, per. com.; Gillett, 1994).
1952	After WW II the activities of the Japanese tuna fleet were geographically restricted by boundaries known as MacArthur Lines. These limits were progressively relaxed and in April 1952 all restrictions were removed (Matsuda, 1987).
1953	U.S. Bureau of Customs ruled that non-U.S. vessels could land fish directly in American Samoa. Headnote 3(a) of U.S. Tariff Schedules was modified to allow duty-free access for tuna canned in American Samoa (Schug and Galea'i, 1987).
1954	Van Camp Seafood Company obtained a lease to operate the defunct Pago Pago cannery (Schug and Galea'i, 1987).
1963	The *Kenyo Maru*, a purse seine vessel owned by Taiyo Fishing company, became the first Japanese purse seiner to operate in the western equatorial Pacific. Fishing was done in the off-season for the Japan home-water fishing grounds (Honma and Suzuki, 1978).
1963	StarKist Foods established a cannery adjoining the Van Camp cannery in American Samoa (Schug and Galea'i, 1987).
1964	H.J. Heinz Corporation purchased Star-Kist Samoa and Ralston Purina purchased Van Camp Seafood Company.
1964	Van Camp Seafood Company commenced a live bait fishery for surface tunas in Palau. The fishery took an average of 6,600 tons of skipjack annually between 1978 and 1981 (SPC, 1984).
Mid-1960s	Concern over the health implications of mercury concentrations in yellowfin tuna led to regulatory action by the U.S. Food and Drug Administration (FDA). These restrictions and subsequent negative consumer reaction were a severe blow to the U.S. fleet.
Mid-1960s	Several cases of botulism poisoning from canned tuna occurred in the U.S.. The subsequent consumer rejection of canned tuna resulted in lower tuna prices and a shock to the U.S. tuna fleet, as well as the U.S. tuna canners.
1966	Management controls were instigated in the traditional eastern Pacific fishing grounds of the U.S. fleet. Some of the U.S. vessels responded by moving to west Africa.

1970	Management controls resulted in the fishing season in the eastern Pacific being open for only 82 days (Felando, 1987), which encouraged exploration and expansion of purse seine effort in other areas.
1970	Seven U.S. purse seine vessels (*Conquest, Cabrillo, Polaris, Connie Jean, Mermaid, Pacific Queen,* and *Kerry M*) made an exploratory fishing cruise to the western Pacific. Four of the vessels withdrew before reaching Palau (Shohara, 1970; Felando, 1987, Felando, per.com.).
1970	Following successful Japanese research cruises to Papua New Guinea, a joint venture PNG/Japan tuna fishing operation commenced using pole-and-line boats. Four such joint ventures were subsequently established in PNG during the early 1970s and the total skipjack catch reached a maximum of 48, 933 tons in 1978 (SPC, 1984).
1970-1971	Two Japanese purse seiners were chartered by the Japanese government to fish the area between the equator and 9 degrees north latitude (Anon., 1974).
1972	The U.S. government passed the Marine Mammal Protection Act. The subsequent restrictions placed a tremendous hardship on the U.S. fleet (Sakagawa, 1991).
1973	StarKist Foods and the New Zealand government entered into an agreement to use the U.S. seiner *Paramount* to survey the country's tuna resources (Felando, 1987).
1974	The Pacific Tuna Development Foundation (PTDF) was formed to encourage the development of tuna resources in the Pacific Islands. Using funding primarily from the Saltonstall-Kennedy Act, PTDF sponsored 11 exploratory purse seine cruises to the central and western Pacific in the late 1970s and early 1980s (Felando, 1987).
1974	Japan Marine Fishery Resource Research Center (JAMARC), using chartered Japanese purse seiner, surveys western Pacific region, successfully develops techniques for fishing on schools associated with drifting objects, validating potential for year long fishery (Watanabe, 1983). Subsequent increase and success of Japanese purse seine effort noted by U.S. fishermen.
1975-1976	Following earlier survey efforts, U.S. seiners successfully operate in New Zealand summer fishery for skipjack and return in numbers for several years (Habib, 1984). Fishing conditions similar to the eastern Pacific ease entry of U.S. vessels into the western Pacific, providing a springboard to operations in the equatorial regions.
1977	The Japanese pole-and-line fleet catches in the Pacific Islands reach a maximum, 154,296 metric tons (Lawson, 1996).
1977	The South Pacific Commission begins major research program on tuna in the central and western Pacific.
1979	The *Voyager* became the first U.S. purse seiner to operate in the Western Pacific fully independent of any charter or sponsorship (PTDF, 1980).
1979	The legal convention establishing the South Pacific Forum Fisheries Agency came into force in August 1979.
1979	Mexico started building tuna fleet and catch increased from 15,000 t to 100,000 t within a few years.
1980	Fishery agreement concluded between the ATA and the governments of Palau, FSM and the Republic of the Marshall Islands (Felando, 1987).
1980	Zee Enterprises established on Guam, basing 7 U.S. superseiners in the western Pacific and developing Tinian as a major U.S. tuna transshipment port.
1981	The marketing functions of the ATA were taken over by the American Tuna Sales Association (Felando, 1987).
1981	The Papua New Guinea skipjack pole-and-line fishery collapses after StarKist pulled out its operation of mostly Okinawan and Korean vessels that had operated there since 1970 (Doulman and Kearney, 1987).
1982	U.S. purse seiner *Danica* arrested for fishing inside the Papua New Guinea exclusive economic zone (EEZ). Vessel was sold back by PNG to the owner. (Van Dyke and Nicol, 1987).
1982	The Van Camp Seafood Company ceased operation of the live bait tuna fishery and associated holding facilities in Palau due to weakness in tuna markets, increases in fuel costs, and growth of the purse seine fishery (SPC 1984, Bank of Hawaii, 1994).

1982	In February 1982 the Nauru Agreement Concerning Cooperation in the Management of Fisheries of Common Interest was established. The Parties to the Nauru Agreement (PNA) consists of eight PICs.
1982	Bumble Bee cannery closed in San Diego (Sakagawa, 1991).
1982	Bumble Bee sold off the 12 seiners it had purchased from Ed Gann in1975 (Iversen, 1987).
1982-1984	A severe El Niño event occurred in the eastern Pacific encouraging a move of U.S. vessels to the western Pacific.
1983	The number of U.S. purse seiners fishing in the western Pacific reached its maximum, 62 vessels (Lawson, 2001). Most, but not all, participated in access arrangements with groups of PICs in two agreements.
1983	The Forum Fisheries Committee establishes uniform minimum terms and conditions of access covering vessel identification, reporting, transshipment, observers, and other aspects.
1983	Total access fees for tuna fishing received from all DWFNs by PICs during the year is estimated to be U.S.$15 million (Clark, 1983).
1984	New Zealand closed access of U.S. purse seiners to seasonal skipjack fishery in productive nearshore waters. Low skipjack prices further discouraged participation in this fishery and pushed vessels to operate all year in equatorial fishery.
1984	Hawaiian Tuna packers tuna cannery closed in Honolulu, Van Camp cannery closed in San Diego, and StarKist cannery closed in Terminal Island (Hudgins and Pooley, 1987, Sakagawa, 1991).
1984	U.S. purse seiner *Jeannette Diana* arrested for fishing inside the Solomon Islands EEZ. The U.S. government embargoed the import of all tuna products from the Solomon Islands (Van Dyke and Nicol, 1987).
1984	U.S. and PICs began negotiations on a fishing access treaty.
1985	Tuna canneries in Puerto Rico and American Samoa were expanded (Sakagawa, 1991).
1985	The government of Kiribati concludes agreement to allow Soviet fishing vessels to operate in its EEZ (Van Dyke and Nicol, 1987).
1986	Guam-based U.S. seiner, *Priscilla M*, arrested in FSM for illegal fishing, fined and released (Van Dyke and Nicol, 1987).
1987	The government of Vanuatu concludes agreement to allow Soviet fishing vessels to operate in its EEZ (Van Dyke and Nicol, 1987).
1987	In April in Port Moresby the Treaty on Fisheries between the Governments of Certain Pacific Islands States and the Government of the United States of America was signed (Alverson, 1989).
1988	South Pacific Tuna Act passed by U.S. Congress in May enabling the Treaty on Fisheries between the Governments of Certain Pacific Islands States and the Government of the United States of America to come into force in June (Alverson, 1989).
1988	Number of U.S. purse seiners fishing in the western Pacific dipped to 31 (Lawson, 2001)
1990	The three largest U.S. tuna canners agreed to stop purchases of tuna caught with techniques that harm dolphins (Sakagawa, 1991).
1991	The catch of the U.S. purse seine fleet in the western Pacific reached its maximum, 216,269 metric tons (Lawson, 2001).
1993	The Treaty on Fisheries between the Governments of Certain Pacific Islands States and the Government of the United States of America was extended for a ten year period.
1993	FFA member countries introduced a ban on transshipment at sea. Port activity at transshipment points increased remarkably.
1994	The first Multilateral High Level Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific was held in Honiara, Solomon Islands (MHLC, 2000). This was the first in a series of seven conferences which led to the establishment of the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean
1995	Pacific Island countries adopt the Palau Agreement for the Management of the Western Pacific Purse-Seine Fishery. The Arrangement entered into force in November 1995 and placed a ceiling on the number of purse-seine licenses that could be issued by the seven PICs party to the agreement.

1995	Zee Fisheries based in Guam became insolvent; 11 purse seine vessels foreclosed upon by mortgage holders and eventually sold (Woodworth and Ebisui, 1999).
1997	Bangkok prices (4-7.5 lb skipjack) reach U.S.$1200 per metric ton.
1997	The first year when the majority of sets by the U.S. fleet were on drifting objects (Itano, 1998).
1999	Bangkok prices dipped below U.S.$400 per metric ton (4-7.5 lb skipjack) for the first time since the U.S. fleet moved to the western Pacific.
1999	A tuna loining plant began operation in the Marshall Islands, with an estimated annual through-put of 12,000 tons per year.
1999	Total access fees for tuna fishing received from all DWFNs by PICs during the year is estimated to be U.S.$60.3 million, a 402 per cent increase since 1983. The tuna fishery produced about ten times the amount of fish as all of the other fisheries of the Pacific Islands region combined. The vessels in the U.S. purse seine fleet represent less than 4% of the foreign tuna vessels operation in the region (Gillett et al., 2001).
2000	The Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean was opened for signature in September 2000. The Convention establishes a Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean.
2000	Several vessels of the U.S. fleet began remaining in port due to low tuna prices. During December most of the fleet was tied up.
2002	Agreement between PICs and U.S. reached on extending the Treaty on Fisheries between the Governments of Certain Pacific Islands States and the Government of the United States of America. The Treaty is to be extended for a period of ten years from June 2003 for a maximum of 45 vessels; during the 15th licensing period (June 02 to June 03) the number of vessels applying for licenses under the treaty is less than 30.
2002	StarKist in the U.S. sold by HJ Heinz and reorganized under Del Monte Foods.
2002	The U.S. Congress passes the Andean Trade Preferences Act with duty free provisions for tuna in pouches but requiring such fish be caught by either U.S. or Andean flag vessels.

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